Telephone Engineer

Volume 33 DECEMBER, 1929 No. 12

Greetings of the Season For many years it has been our pleasure to say a few words of seasonal greeting to the thousands of readers and friends of TELEPHONE ENGINEER. Our manner of expressing it may have changed, but it is the feeling and not the manner of expression that matters. No form of words can better express our well wishes, than a simple and sincere repetition of the hope that you may all have a very merry Christmas and a happy and prosperous New Year.

Paying an Adequate Wage During the recent industrial conferences called by President Hoover following the collapse of stock market prices, Mr. Henry Ford made the front page of the newspapers of the land by the announcement of a general increase in wages in the huge industrial concern which he controls. While the example had not generally been followed by other industries, it has been the cause of many statements that industries generally have found that high wage scales pay.

We are not familiar with any statistics comparing the average wage in the telephone industry with other industries. We do know that few industries have as stable and contented body of employes as does the telephone industry. This is, no doubt, due in part to the inherently interesting nature of the work; in part to a policy of providing comfortable and agreeable working conditions and in part to the payment of wages that are as good or better than the employee might be able to earn in other employment in his own locality.

There was once a time when telephone wages, particularly in certain localities, were not marked by their generous proportions. This condition has pretty well been corrected. If there are isolated places where this has not been done, the year 1930 should not pass without some progress. If rate increases are necessary to pay a standard of living and saving wages, they should be obtained. We have never yet heard of opposition to rate increases where the public was convinced that they were necessary to pay adequate wages to telephone workers.

The Rural Line Problem In these columns from time to time we have discussed the problem of adequate service in the small exchange and the rural line. We have been taken to task, mildly, of course, by readers from certain sections of the country for the amount of space we have devoted to what in their judgment is a minor element in the general problem of furnishing universal telephone service. Anyone who thinks that it is a minor problem may get a different view by consulting the official charged with connecting company relations of the Bell system companies or by talking to the management of any Independent company of any size.

In Telephony's 1929 Directory we find listed over 4,500 companies with less than 250 stations. Taking a band across the country from New York to Pennsylvania to the western boundaries of Kansas, Nebraska and the Dakotas, there is not a single state, Nebraska excepted, that has fewer than 100 of these small companies and Nebraska lacks less than ten of reaching that number. Other states also have large numbers. It may safely be assumed that practically all of these small exchanges are almost entirely rural in character.

Secretary Crowley of the Minnesota Association is authority for the statement that 43 per cent of the rural telephones of that state are operated by mutual lines. We have heard it said that 80 per cent of the rural telephones of Iowa are on grounded lines. A drive across that state will prove that there are not many places where the rural lines are of high grade construction. We are familiar enough with conditions in the five states bordering Lakes Erie and Michigan to know that the rural telephone plants in many places could stand substantial improvement.

Perhaps there has been too much said about this condition, but it is likewise true that there has been too little done about it. Conditions can not be remedied in one year or two, but will require years of

effort. Millions of dollars will have to be expended to put the rural lines of the country in first-class shape.

It is certain that these millions will not be expended until the farmers of the country are willing to pay rates that will justify the expenditure and this can not be expected during the present depressed condition of agriculture. However, agriculture is too basic an industry to be permanently depressed and the turn for the better will come. When the turn does come there should be a definite program of some sort for improvement of the rural line situation.

Beginnings of Telephone History

On another page in this issue is a review of a recent book, "Beginnings of Telephony," by Frederick L. Rhodes of the staff of the American Telephone and Telegraph Company. The historical character of the book reminds us that the telephone has now reached an age where its early days are becoming history.

History can not be written too soon after the event. It presupposes a judicial examination and appraisement of the causes and results of the event. Rarely can that judicial view be presented by one who has taken part but recently in the events concerned in the narration. Personal bias and emotions arising out of conflict prevent an equitable weighing of motive and action. Results do not always become apparent even after many years.

In the case of the telephone, the earlier years are now history. Bell, the inventor, has passed on and most of the men associated with the early days of the art have either followed or preceded him or are now practically out of active work. Any feelings that the present generation may have, arising out of the conflicting claims of Bell, Edison, Gray and others or between the early Bell companies and the Western Union Telegraph Company or other companies are historical rather than personal.

In a few years, the beginnings of that other great movement in telephone, the Independent movement, will have become history. Already many of the great figures of its beginnings have gone. That movement should also have its historians who can tell its story. The Independent Pioneer Telephone Association has made a start in the collection of relics of early type of Independent equipment for an historical exhibit. The collection should not stop at material things, but should include data from which a future history can be written.

Ready for Promotion

By Edgar A. Guest

There's going to be a vacancy above you later on,
Some day you'll find the foreman or the superintendent gone,
And are you growing big enough, when this shall be the case,
To quit the post you're holding now and step into his place?

You do the work you have to do with ease from day to day,
But are you getting ready to deserve the larger pay?
If there should come a vacancy with bigger tasks to do,
Could you step in and fill the place if it were offered you?

Tomorrow's not so far away, nor is the goal you seek,
Today you should be training for the work you'll do next week.
The bigger job is just ahead, each day new changes brings—
Suppose that post were vacant now, could you take charge of things?

It's not enough to know enough to hold your place today,
It's not enough to do enough to earn your weekly pay,
Some day there'll be a vacancy with greater tasks to do—
Will you be ready for the place when it shall fall to you?

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Electrical Networks and Their Application to Telephony

Here Is Another One of Those Interesting Articles Written by F. J. Dommerque, Fellow A. I. E. E., as Only Mr. Dommerque Can Write Them. You Will Find It Interesting

Definitions

In the study of communication circuits the term "electrical network," or briefly, "network," is used as a general phrase for the combination of resistances, inductances and capacities. There are numerous types of networks, some simple, some complicated. All the networks a telephone practician is interested in are the networks pertaining to the transmission of speech. Therefore the first requisite will be to determine the relation of the network to the line, or rather to fix the representation of the line with relation to the network.

In connection with the following discussion we consider the telephone line as being a metallic circuit containing resistance, inductance leakance and capacitance. All lines, however perfect, have some leakage through the insulating material, which may be so small on short lines that it can be neglected, but on long transmission lines it becomes a factor. The leakage conductance, that is, the leakance usually designed by "G," is the reciprocal of the insulation resistance and is expressed in mhos. The current consumed by leakage is in phase with the e. m. f. of the circuit, while the current consumed by the capacitance "C" of the circuit is 90° in advance of the e. m. f. The capacitance is parallel with the leakance, their joint admittance is the geometrical sum of their separate admittances, which would be $\sqrt{G^2+(\omega C)^2}$ (see TELEPHONE ENGINEER, November, 1927, on Impedance, Reactance and Resonance), which is in the treatises on telephone transmission commonly written in the form of a complex quantity as $G+j\omega C$ (see TELEPHONE ENGINEER, January, 1927, page 32), this sum representing the "dielectric" admittance. The reciprocal of the dielectric admittance is the dielectric impedance. The phase angles of dielectric impedance and dielectric admittance are the same in magnitude but opposite in direction; that is, if the phase angle of the dielectric admittance is ψ, the phase angle of the dielectric impedance will be $-\psi$.

The impedance due to resistance R and inductance L—that is, the "conductor" impedance of the circuit—is $R+j\omega L$, having the phase angle Φ; the geometrical mean of conductor impedance and dielectric admittance equals

$$\sqrt{(R+j\omega L)(G+j\omega C)};$$

the geometrical mean of conductor impedance and dielectric impedance equals $\sqrt{\frac{R+j\omega L}{G+j\omega C}}$; the latter expression is a vector at a phase angle $\frac{\Phi-\psi}{2}$, while the former expression is a vector at a phase angle $\frac{\Phi+\psi}{2}$. When the circuit is indefinitely long, the expression $\sqrt{\frac{R+j\omega L}{G+j\omega C}}$ represents the apparent resistance or the input impedance of the circuit and may be designated by Z_∞; this is the impedance offered by an infinitely long line; that is, a line of such great length that the current which reaches the end of the line is negligible in comparison to the current entering the line. This impedance is properly named the "characteristic" or the "iterative" impedance of a line and defined as the vector ratio of the applied e. m. f. to the resulting steady state current upon a line of infinite length and uniform structure, or upon a network composed of an infinite number of periodic recurrent structures.

The expression $\sqrt{(R+j\omega L)(G+j\omega C)}$ designates the "Propagation Constant" of the line.

To design a network which will represent the resistance, inductance, leakance and capacity of a line the above cited

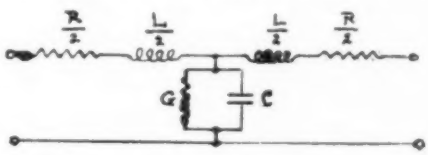


Fig. 1

relation of these constants of the line has to be taken in consideration, namely, that resistance and inductance are in series with the line, and leakance and capacity in shunt to the line. Thus we may construct a network as shown in Fig. 1, which will represent an equivalent circuit of a line having the constants R, L, G and C. But this equivalent circuit is only a fairly accurate representation when the line is short. Extending the line increases the inaccuracy of the representation by this network. It then becomes advisable to divide the line into sections and use a network for each section, thus obtaining a representation of the line by a series of networks, each of which contributes its share to the total amount of resistance, inductance, leakance and capacity of the line.

Equivalent Circuits

The standards of the A. I. E. E. define an equivalent circuit as a simple network of series and shunt impedances, which at a given frequency is the approximate electrical equivalent of a complex network. These standards give four types of equivalent circuits; we will state them in the order they are given in the standards.

1. *"T" Equivalent Circuit.*—A "T" equivalent circuit is a triple-star or "Y" connection of three impedances externally equivalent to a complex network. See Fig. 2a for symbol.

2. *"I" Equivalent Circuit.*—An "I" equivalent circuit is a connection of five impedances in the form of Fig. 2b, which is externally equivalent to a complex network. It differs from the "T" equivalent circuit in that the impedances are arranged symmetrically with the sides of the circuit, which is often desirable in connection with practical problems, as indicating that the circuit is balanced with respect to ground.

3. *"Π" Equivalent Circuit.*—A "Π" equivalent circuit is a delta connection of three impedances externally equivalent to a complex network. It is also called a "U" equivalent circuit. See Fig. 2c for symbol.

4. *"O" Equivalent Circuit.*—An "O" equivalent circuit is a connection of four impedances in the form shown in Fig. 2d, externally equivalent to a complex network. It differs from the Π equivalen circuit in that the impedances are arranged symmetrically on the two sides of the circuit, which is often desirable in connection with practical problems, as indicating that the circuit is balanced with respect to ground.

From the above definitions it will be seen that the "T" and "Π" equivalent circuits are the two principal and fundamental ones, and that the "I" and "O"

equivalent circuits are merely modifications of the two others.

Applications

We will indicate on an example the application of the above equivalent circuits, omitting however the mathematical explanations, as they require a knowledge of hyperbolic functions, with which the average reader is not often familiar.

When the three constants of the line, resistance, inductance and capacitance, remain practically the same at all points along the line, the conductor or the line may be considered "uniform." When, however, at certain points impedances are introduced in series, for instance in the form of loading coils, or capacities such

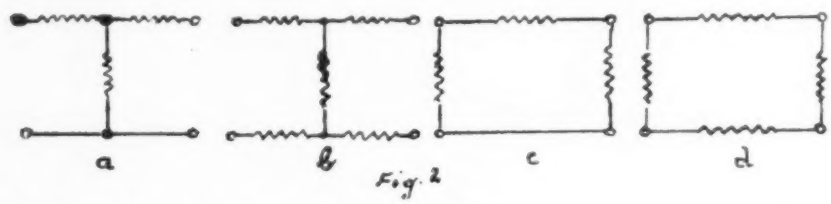


Fig. 2

as leaks, or both, then the conductor or the line becomes "non-uniform."

The problem is then to express a non-uniform line in terms of the uniform line, or with other words to establish the equivalence between uniform and non-uniform lines. This can be done in various ways. One way, which has been followed by Dr. Kennelly, is by using the equivalent circuits T and Π. In conformity with the definitions given above, he states that a uniform line carrying continuous currents has an equivalent circuit, constituted by a group or groups of resistances, which may be substituted for the line without change in the electrical conditions outside of the line.

He simply takes the two horizontal arms in series of the T equivalent circuit, makes them equal and lets them represent the line resistance, while the vertical arm or staff represents a resistance in derivation which acts as a leak. Then he takes the Π equivalent circuit and lets the horizontal arm or architrave in series represent the line resistance, and the two vertical arms or pillars in shunt or derivation the two resistances acting as leaks.

These equivalents, though, have to be taken with a reservation. In the case of the T, the leakance is placed at the middle of the line, while in the actual uniform line the leakance is distributed all along the line; in the case of the Π, the leakance is lumped at the two junction points of the pillars with the architrave.

Now suppose the line is loaded by the insertion of impedances in series at regular intervals, then each section containing an impedance may be replaced by its equivalent T. When the impedances are equal, each T will receive an additional resistance, which is divided into two halves, and one-half is added at each end horizontally to the line resistances, the vertical arm or staff remaining the same as before. For these new T's with their load extensions must then be found the equivalent uniform line by applying a factor of correction for lumpiness. The values of the correction factors for the above cases are given in Dr. Kennelly's book, "The Application of Hyperbolic Functions to Electrical Engineering Problems." University Press, London, 1912. In Fig. 3 is shown the network structure representing one section of a loaded circuit terminated at mid-coil. In the middle is the equivalent network of the non-loaded line and at the right and left side of it the above-mentioned extensions.

The preceding example showed in a general way the use of *networks as equivalents*. We now will give an example of the application of *networks for an approximation*. Usually the problem is solved by a mathematical formula and expressed in an equation, which mostly takes the form of a series of terms which never end, but which after a while become of such small value that an addition of more terms will add so little that they may be neglected. The question arises, then, where to stop. The addition of each term in the series brings the solution a little nearer to or rather approaches the real value a little more. The relationship between such a series of

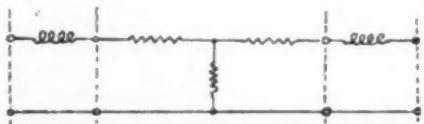


Fig 3

terms constituting a formula and the approximations by an extension of networks has been shown in a very illustrative way by Mr. Osborne in a paper read before the summer school for electrical engineering teachers at Pittsburgh in July, 1928, on the "Principles of Electric Circuits Applied to Communication." He presented by successive approximations how an expression is obtained for the ratio of voltage at the transmitting end of a line to that at the receiving end. The equation he gives is applicable to power and communication lines; it is general. The reader is not confronted with high mathematics, the only unusual sign is the "!" sign, which simplifies an abbreviation for a product of two or more numbers. Instead of writing 1×2 we can write $2!$; instead of $1 \times 2 \times 3$ we write $3!$; instead of $1 \times 2 \times 3 \times 4$ we write $4!$ and so on. The equation is infinitely long which is signified by the dots; each additional term brings the equation nearer to its accurate value, which, however, is never reached. We will follow the steps taken by Mr. Osborne in his lecture. He first gives the general equation for the ratio of the transmitting or sending voltage "V_t" to the receiving end voltage "V_r" by a series of ascending powers of "Zl," the total resistance and reactance of the line, and of "Yl," the total derivation or shunt admittance of the line, "l" designating the length of the line. This equation he writes as follows:

$$\frac{V_t}{V_r} = 1 + \frac{Zl}{Z_r} + \frac{YZl^2}{2!} + \frac{YZ^2l^2}{3!Z_r} + \frac{Y^2Z^2l^4}{4!} + \frac{Y^2Z^2l^5}{5!Z_r} + \ldots\ldots$$

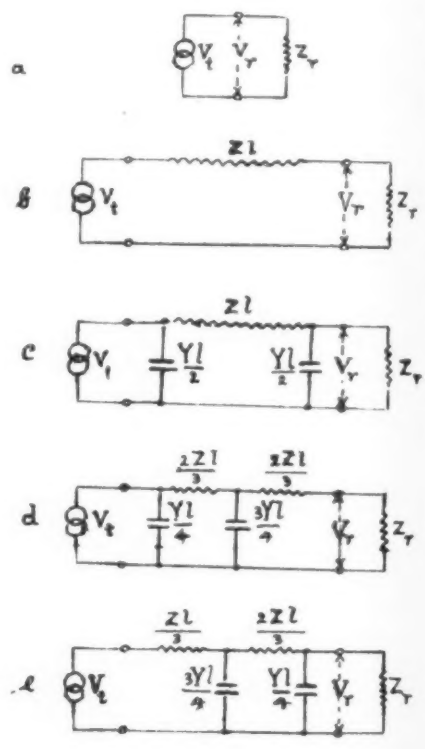


Fig 4.

The successive steps of approximation are illustrated geographically by the networks shown in Fig. 4a, b, c, d and e. In Fig. 4a the transmitting station is directly connected with the receiving station, therefore there is no line, and consequently the transmitting end voltage and receiving end voltage are one and the same, as is noted in the figure, where V_r is the voltage between the two terminals at the junction. The input terminals and the output terminals are "1," as stated by the first term of the series.

In Fig. 4b the line is presented as

having resistance, but no capacity. Here the receiving end voltage is given as V_r between the output terminals of the network, the transmitting end voltage V_t being indicated at the transmitting station, which holds also good for the input terminals of the network. This network represents the first plus the second term of the series.

In Fig. 4c it is assumed that the capacity of the line is concentrated at two points, one-half at each end of the line, giving a simple Π network. This network represents the three first terms of the series.

In Fig. 4d one-fourth of the capacity is assumed to be concentrated at the transmitting end three-fourths at a point two-thirds distant from the transmitting end. This equivalent network corresponds to the four first terms of the series.

In Fig. 4e the position of the points

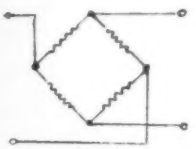


Fig 5

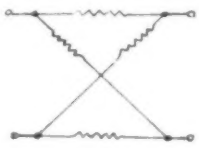


Fig 6

where the capacity is assumed to be concentrated is reversed from that indicated in Fig. 4d. This network corresponds to the five first terms of the series. The more terms are used the nearer the true value is approached.

To return for a moment to the standard networks it may be mentioned that the "O" equivalent circuit can also be represented by a network in the form of a Wheatstone bridge as indicated in Fig. 5, or to adapt it to the method of representation of the standard equivalent circuits, as a network in the form shown in Fig. 6; this type is known as a "lattice" type network.

So far in our discussion we have considered the network to consist of one section only. There are also "structures," and perhaps they are in the majority, which are composed of a number of sections. In a great many cases the sections are all alike, but often there is a deviation in one or more sections from the rest of them.

It is out of the question to discuss in this paper all the different forms in which networks may appear. Their application has become so general, because they lend themselves so easily to the solution of new problems, to the finding of practical approximations and to the simplification of old methods, which were not only laborious but also demanding an enormous capacity for mathematics.

In telephone work in particular, networks afford great help in the study of processes or of means and methods whereby the transmission over a telephone line can be extended, improved or freed from distortion and other disturbances. A filter is a type of network which separates electric currents so as to let currents of a certain frequency pass and hold back others. A knowledge of filters is an absolute requirement to the comprehension of the progress in our modern long distance telephone work. Of equal importance are the balancing networks used so extensively for simulating lines in repeater operation on long distances. Then there are the supplementary or complimentary networks as line extensions to smooth out impedance variations; and so forth. Balancing and complimentary networks have been described on pages 17 and 18 of the June, 1928 number of the TELEPHONE ENGINEER.

We will add one more network as an example of the use of networks of the lattice or bridge type. In Fig. 7 is shown a network structure composed of a series of sections, how many is not indicated, it holds good for any number. This network structure is an "all pass" lattice type network; it passes all frequencies without attenuation and finds a place as phase equalizer.

All lines for transmission of speech cause more or less distortion of the

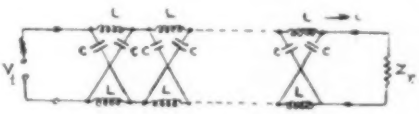


Fig 7

speech in transmitting. On short lines the distortion may be so small that it cannot be noticed in ordinary conversation. To study the distorting action the properties of the distortionless line are taken as a basis; methods of distortion correction are searched for, and for this search networks of the kind shown in Fig. 7 are of great assistance.

Oklahoma District Telephone Meetings

The two district meetings of the Telephone Division, Oklahoma Utilities Association, held last week at Gotebo, November 12, and Frederick, November 14, were well attended in spite of adverse weather conditions. The attendance at Gotebo was 50 and at Frederick 90. A noonday luncheon was served in connection with the Chamber of Commerce at which John L. Shaw, president of the Gotebo Telephone Company, presided as toastmaster. Principal address at the luncheon included: "European Utilities," by Judge W. L. Crittenden, Oklahoma City, field representative, Oklahoma Utilities Association; "Personal Efficiency," by G. B. Dunlap, Oklahoma City, director of public relations, Southwestern Light and Power Co., and "The Telephone from the Standpoint of the Public," by Rev. H. L. Griffin, pastor, Gotebo Baptist Church. An afternoon business session was held with John L. Shaw presiding. Talks were made by H. W. Hubenthal, Oklahoma City, engineer, Oklahoma Utilities Association, on "Operating Matters," and M. A. Sanders, Oklahoma City, connecting company agent, Southwestern Bell Telephone Company, on "Ownership of Telephone Facilities by Telephone Companies." Among other subjects discussed were: "Rural Telephone Problems" and "Toll Rates."

The Frederick meeting and luncheon were held in the First Baptist Church. An address on "Personal Efficiency" was delivered by G. B. Dunlap, Oklahoma City, director of public relations, Southwestern Light & Power Co. The business meeting in the afternoon was opened with an address on "Telephone Service from the Public's Viewpoint," by L. M. Wagon, Frederick, secretary of the Chamber of Commerce. A. G. Davidson, Frederick, district manager, Southwest Telephone Co., presided at the business session and also as toastmaster at the luncheon. Addresses at the meeting included: "Utility Statistics," by Judge W. L. Crittenden, Oklahoma City, field representative, Oklahoma Utilities Association; "Use of Direct Calibrating Volt-Ohmmeter for Testing of Telephone Lines and Equipment," by C. M. Tuggle, Roosevelt, manager, New State Telephone Co.; "Ownership of Telephone Equipment," by M. A. Sanders, Oklahoma City, connecting company agent, Southwestern Bell Telephone Co., and A. G. Davidson, Frederick, district manager, South Telephone Co.; "Toll Rates," by M. A. Sanders.

John Taggart Dead

John Taggart, representative of Stromberg-Carlson Telephone Mfg. Co., passed away at his home in Indianapolis, Ind., November 6.

Mr. Taggart had been associated with the telephone industry almost all his life and was recognized as an authority on almost any phase of telephony.

Mr. Taggart was employed as installer by the Stromberg-Carlson Company in April, 1901, when it was situated in Chicago. His first installation was the Tri-State job at St. Paul in 1901 and 1902.

In 1904 the company was moved to Rochester and Mr. Taggart went with it. He was made chief installer in 1905 and remained at that position until the world war. When the United States entered the war he enlisted in the Signal Corps, remaining in the army until 1919 when he was honorably discharged.

He was re-employed by Stromberg-Carlson in 1920 and entered the sales department as its representative in Indiana, holding that position until his death.

Studying Telephone Methods

This Is Chapter 34 of a Series of Articles Written by E. R. Collins of the Manitoba Telephone System, Brandon, Manitoba, Canada

The Switch Shaft that carries the Wipers, and the Wiper Cords, is the mechanical arm that connects the Wiper Cords, to the proper contacts of the Connector Bank. The operation of the shaft in this particular type of switch is first in a vertical direction, and then in a rotary direction, as described in the previous chapter.

When the shaft is in its normal or Non, operated position, it is free to move up and down. The Wipers are free of the bank, so that if the finger is placed under the center of the lower wiper hub, which will be immediately under the shaft the shaft can be raised up until the upper wiper hub touches the frame of the switch and prevents further upward movement.

Mounted on the upper end of the shaft, is an assembly consisting of a spring cup, with its bracket. This is illustrated in Fig. 268.

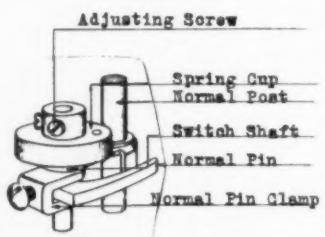


Fig. 267

The spring is connected at its center to the Spring Bracket. This bracket is free of the shaft. The shaft projects up through the bracket, but the opening is large enough to give the shaft free movement. The outer end of the bracket has an oval opening through which projects a Normal Post. The Normal Post is screwed into the frame of the switch. The upper bearing of the Shaft is also secured to the frame of the switch, so that the position of the shaft and the normal post are constant in relation to each other. The other end of the spring is attached to the outer rim of the Spring Cup. The Spring Cup in turn, is attached to the Switch shaft rigidly by the set screw.

On the lower edge of the Spring Cup Bracket, is a projection downward, which is called the *Normal Pin Stop*. When the shaft is normal there is a light lever called the Normal Pine, which is resting against this Normal Pin Stop. The Normal Pin is attached to the Switch Shaft, by a clamp. This clamp permits adjustment of the Normal Pin on the shaft. If the Normal Pin is now attached to the shaft, so that the shaft can be raised and lowered, then the Spring Cup and the Normal Pin will have a fixed relation to each other on the shaft. If the shaft is raised by hand, then the spring cup and the Normal pin, will rise together with the shaft, because they are bolted to the shaft. The Spring Cup Bracket will also rise with the shaft, because the Spiral Spring is attached to the Spring Cup and the Bracket as well, and serves as a lifting medium for the bracket.

Now if the cup is turned on the shaft, in the direction of the curved arrow, there will be tension placed on the spring. This would cause the Shaft to turn in the opposite direction. But this is prevented, by the Normal Pin, which presses against the Cup Bracket projection. The whole assembly, becomes one member, that is, the Cup Bracket, and the Normal Pin. The Normal Post which projects up through the oval opening of the Cup Bracket, acts as a guide to the bracket and in turn to the shaft. Therefore if the shaft is raised or lowered, it is prevented from turning more than the distance permitted by the slackness between the Normal Post and the Oval opening of the cup bracket. This is illustrated in Fig. 267.

Stationary Dog

In Fig. 269, we have a view of the Shaft and the Vertical and Rotary hub. The Vertical and Rotary Hubs are constructed in one piece, but the two parts have separate functions.

Referring to the small inset of Fig. 269, we are looking down over the top of the Vertical Hub. There is a slot shown in the Vertical Hub. Into this slot projects a piece of metal called the *Stationary Dog*. The Vertical hub, is milled in to the bottom of the Vertical Teeth. The Stationary Dog projection, therefore, rides in the slot, and allows the shaft to be lifted freely as long as the Normal Pin is resting against the Cup Bracket. The combination of these features, mean, that the Wipers are always caused to rise in a vertical direction without catching on the banks. It also insures that the Rotary Teeth are in a fixed position in regard to the Rotary Magnet Mechanism. On the lower end of the Stationary Dog is another projection, which is called the Vertical Pawl Normal Stop, or Vertical Pawl Rest.

On the Vertical Pawl, which is seen in Fig. 269, is an extension which normally rests against the Stationary Dog Stop. The Stop is so adjusted that the tip of the Vertical Pawl will just clear the teeth of the Vertical Hub when the shaft is raised and lowered by hand. The Stationary Dog of course is mounted on the frame of the switch, which is indicated by the shaded portion.

Release Link

Mounted on the opposite side of the Shaft from the Stationary Dog is another metal piece called the *Double Dog*. The Double Dog is pivoted on two bearings. On the forward part of the Double Dog are two projections, one the Vertical Dog, and the other the Rotary Dog. On the rear part of the Double Dog is a projection which engages a spring called the Release Link.

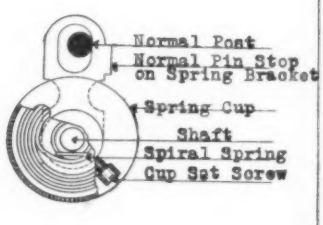


Fig. 268

In Fig. 270 we have shown the release link in two positions. In the lower position, Fig. 270, the release link is shown with the heavy black of the double dog showing through the square opening in the link. The release link is really a spring tensioned downward. In the upper section of Fig. 270 the double dog shows an upward extension under the release link. When the switch is normal, the projection of the double dog is extending upward through the release link. The double dog is able to move from side to side, but not up or down. The release link can be adjusted from left to right, but normally is fixed at the left end. The right end of the release link can be moved up and down. The release link will therefore be hooked over the double

dog projection when the switch is normal. Again in Fig. 270 the upper portion the armature of the vertical magnet has an arm which extends forward from the coils, but the metal of the armature extension is turned edgewise to the armature proper. On the armature extension, there is a lower projection, which can be seen in Figs. 271, 272, 2nd 273. The release link projects between the armature extension and this lower projection. Therefore if the vertical armature is lifted, the release link must lift with it. Again referring to Fig. 271, we have the double dog, and the double dog spring shown. The spring will press the double dog teeth toward the hub of the switch shaft. This is illustrated more clearly in Fig. 274 which shows the relation of the double dog pivot to the spring. The heavy black portion of the double dog in Fig. 274 indicates the portion of the dog that extends up through the release link. Therefore if the release link is lifted by the vertical magnet, the double dog is freed, and the spring will press the forward end of the double dog in toward the shaft hub.

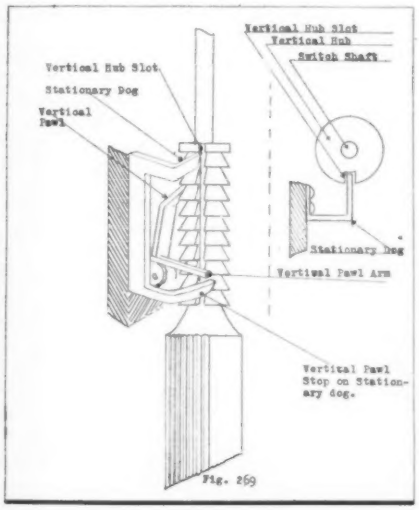


Fig. 269

The Vertical Motion

In Fig. 271 we have a side view of the vertical magnet, the vertical armature, and the vertical pawl and vertical hub. The projection of the vertical pawl is shown extending to the back of the vertical hub by the dotted lines. Beneath this extension of the pawl can be seen the lower projection of the stationary dog, also at the rear of the vertical hub. The vertical armature has a strong spring attached to the under side of the armature, which bears up against the switch frame. This is adjustable to the frame with an adjusting screw. The downward pressure of the spring on the armature exerts a strong pull to oppose the armature when rising. The vertical armature rests in its normal position as shown in Fig. 271 against a portion of the switch casting, not shown. When in this position, the pawl extension is raised up by the double dog pawl stop, so that the upper tip of the pawl is free of the vertical hub teeth. The shaft can therefore be raised and lowered freely without engaging the pawl.

The double dog is shown a little out of its proper position but will possibly better show the relation of the double dog to the vertical operation. The double dog spring is shown above the dog attached to the frame, and its lower end so tensioned that it will press in on the double dog against the hub. Fig. 271 therefore shows the normal relation of the vertical pawl and the double dog to the vertical hub.

In Fig. 272 we have the same arrangement as 271, only the armature is pulled up by having current applied to the vertical magnets. These magnets have therefore first to overcome the pressure of the armature spring. As the armature rises, it lifts the pawl extension away from the stationary dog pawl stop. There is a small coil spring attached to the lower end of the pawl and the armature. As soon as the pressure of the pawl extension against the stop is relieved, this spring tilts the tip of the pawl forward toward the vertical hub, and the tip of the pawl enters under the lip of the first tooth of the vertical hub. As the vertical armature continues to rise, the pawl tip enters further into the tooth of the hub, until the armature completes its stroke. When the armature has completed its stroke, the pawl will have its tip fully entered into the tooth, and the curved portion will be wedged firmly against the switch frame as shown by the shaded portion. The shaft is fastened to the frame with upper and lower bearings, so cannot move forward, but can move upward. The pawl then being wedged between the frame and the vertical hub securely locks the shaft so that it cannot move up or down. If the vertical magnets project down too far the armature will hit them before the pawl hits the frame. This condition can be detected by a slackness in the shaft. It can be moved up and down by hand. The adjusting thimble in the frame is to allow the magnet to be raised or lowered to correct this condition. Some play is necessary. Therefore when the armature is operated electrically, there should be a play of .002 inch upward on the shaft. This is to allow for the operation of the double dog. When the armature rises, it also lifts the release link, so that the double dog is unlatched, and allowed to move in toward the hub by the double dog spring pressure.

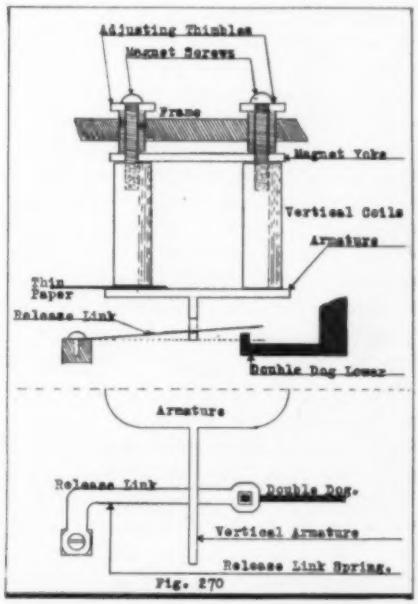


Fig. 270

The double dog vertical tooth is shown in Fig. 271 held away from the hub. In Fig. 272 the double dog is shown resting under the No. 1 tooth of the vertical hub. With the armature still operated, there should be a clearance of .002 inch between the double dog and the tooth of the vertical hub. A .002 inch thickness gauge is shown inserted between the dog and the hub tooth. The gauge should slip

MANITOBA TELEPHONE SYSTEM

Brandon, Man., Dec. 6, 1929.

J. A. Smith, President,
Telephone Engineer Publishing Co.,

Chicago, Ill.

Dear Mr. Smith:

During the past three years the writer has received a great deal of pleasure in writing the series on "Studying Telephone Methods." The responses received from widely separated parts of the world have been a source of encouragement. From Siam, and Norway, from South America and the Philippines. From United States and different parts of Canada. It goes to show that the ENGINEER serves telephone men of many Nations.

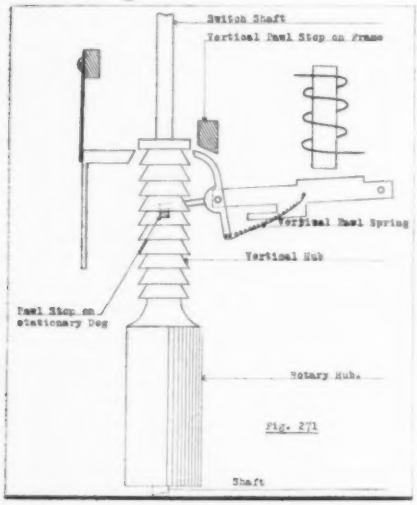
The articles by Mr. Dommerque have been of great assistance to me at different times. The other splendid articles appearing in the TELEPHONE ENGINEER make it a paper well worth reading and keeping for reference.

To all the readers of the TELEPHONE ENGINEER, and to you and your staff, I take this opportunity of sending the season's greetings.

Yours truly,
E. R. COLLINS.

through easily. Not more than .010 inch is allowable for this adjustment.

The shaft is oiled by means of a felt oil washer set in the upper and lower shaft bearings. The shaft requires to be kept clean and oiled about every six months. Oiling should be done only often enough to keep the shaft free from any drag. *Oiling of Automatic equipment must be carefully done, as too much oil can easily be applied.* We will discuss oiling at another time.

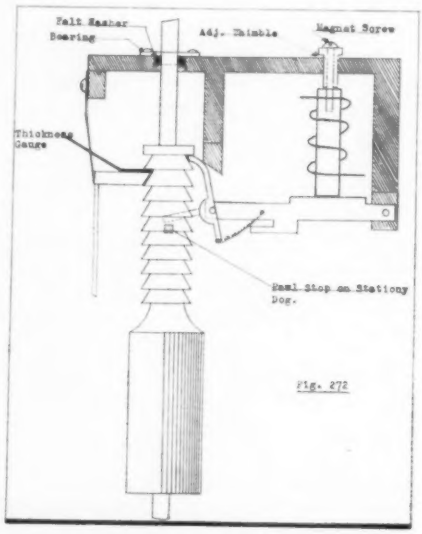


In Fig. 273, the armature is shown at normal again. The weight of the armature would cause it to fall, but as these magnets must operate at a high speed, the armature must release very quickly. Therefore the strong spring is provided to make sure that the armature releases quickly. The pawl is shown tilted back free of the vertical hub, and the double dog is still under the No. 1 tooth of the hub. The shaft is therefore raised one step, and the wipers attached will be raised to the first level of the bank attached. Each impulse of the vertical circuit will therefore cause a complete operation of the vertical armature, and the double dog will hold each step gained. The double dog will remain operated as in Fig. 273 until the switch is released again.

The vertical and rotary magnets consist of two magnet coils mounted on a yoke, to provide the equivalent of a horseshoe magnet. It is necessary that the armature be brought up against the two pole pieces evenly. This can be checked in two or three ways, but the simplest is to use a strip of thin paper. Slip the paper under one pole piece and operate the magnet electrically. Note the pull on the paper when held between the armature and the core of the one coil. Then try the same test with the opposite coil. The pressure in each case should be the same. If one coil is a little lower than the other the difference in pressure will be quite noticeable. The paper will slip out easily from the one coil. This applies to the adjustment of the vertical as well as the rotary coils. The adjusting thimbles are provided to correct this difference in pull, as well as to govern the stroke of the armature. This is shown in Fig. 270.

Rotary Motion

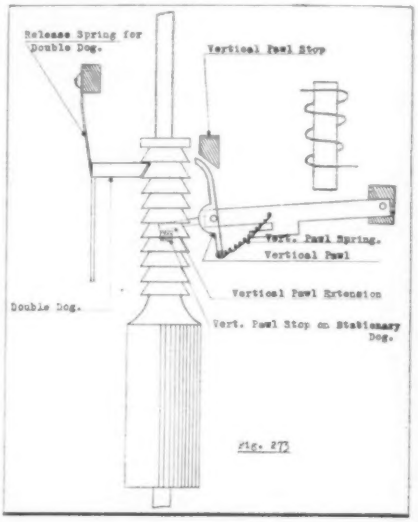
The rotary armature is slightly different in construction, although the same in principle as the vertical. The armature spring is shown in Fig. 274, hooked under the adjusting screw which is set into the frame of the switch. The armature is pivoted at the left, so that if the coils are energized, the spring tension must be overcome before the armature can pull up. The armature must therefore have a strong pull to overcome the pull of the spring and the load on the end of the armature lever. The rotary armature pawl is somewhat different in shape from the vertical armature. The extension of the vertical pawl is missing on the rotary. There are two normal back stops which are adjustable. The armature back stop allows the armature to draw back far enough to bring the tip of the pawl at the right position to drop into the tooth of the rotary hub facing it. As the armature pulls up, the pawl spring holds the tip of the pawl against the rotary pawl set screw so that the tip slides into the tooth of the rotary hub. The curved shoulder of the pawl engages the front stop so that when the stroke of the armature is complete, the



rotary pawl is wedged between the rotary hub and the front stop. This brings the rotating shaft to a full stop. Unless the armature fully completes its stroke the pawl is not wedged, and the shaft is apt to turn more than the one step. This same action takes place in the vertical motion, the rising shaft being brought to a complete stop between impulses.

The lower tooth of the double dog has already dropped into one of the rotary hub teeth. As the hub turns, the double dog is forced up and over the next advancing tooth of the hub, but is forced into the next tooth by the double dog spring. The teeth of the rotary hub are not as deep as the vertical hub teeth. Therefore, although the double dog is forced out over the rotary tooth, the greater depth of the vertical teeth, prevent the double dog from lifting out clear of the vertical teeth. This prevents the shaft from dropping, while the rotary motion is in progress.

When the rotary armature is fully operated, there should be a space between



the rotary teeth and the face of the double dog. This space is measured by means of a thickness gauge as shown in Fig. 275. A .002 inch thickness gauge should slip easily between the dog and the tooth of the rotary hub. The position of the release link is shown in Fig. 275 with the link riding above the projection of the double dog.

Referring back again to Fig. 269, the position of the stationary dog in relation to the vertical hub is important. When the shaft is rising the upper projection of the stationary dog rides free in the slot milled up through the vertical hub teeth. When the vertical impulses bring the shaft up to any tooth, the stationary dog tooth will conform to the shape of the tooth, and must be adjusted so that the shaft will rotate. The double dog vertical tooth is holding the shaft up. The upper edge of the stationary dog at its tip will be about .002 inch below the lower surface of the tooth above it. As the shaft rotates then the stationary dog is riding clear of the vertical hub, but is well into the tooth into which it projects.

Release Action

In Fig. 276 we have sketched the arrangement of the release magnet. The release coil consists of a single winding. The coil is mounted on a yoke, which has two projections stamped into its upper part at the right. The release armature has two square openings which fit over the two projections of the yoke. Above the coil assembly is a coiled spring which pulls on the upper end of the release

armature. This holds the lower end of the armature away from the coil. The length of the armature gives a long stroke to the adjusting screw mounted in the bottom of the armature. The set screw in the upper end of the armature controls the distance the armature is held away from the core.

In front of the lower adjusting screw

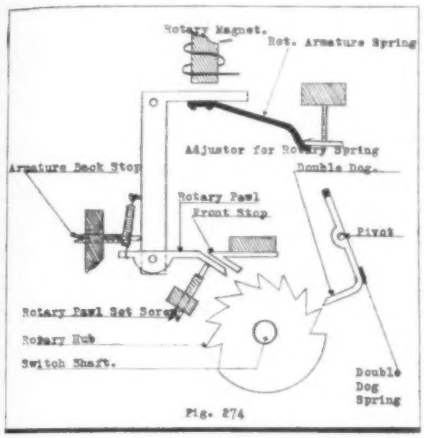


Fig. 274

is the back end of the double dog. This is shown in the right hand portion of Fig. 276. The release armature is normally held about ⅛ inch from the double dog when the switch is up and in. To release the switch, the release coil is energized. The lower end of the armature drives in and forces the back end of the double dog in, and the double dog teeth are forced out from the hub. At the same time the release armature drives the double dog in far enough to allow the release link to slip down over the projection on the double dog. When the

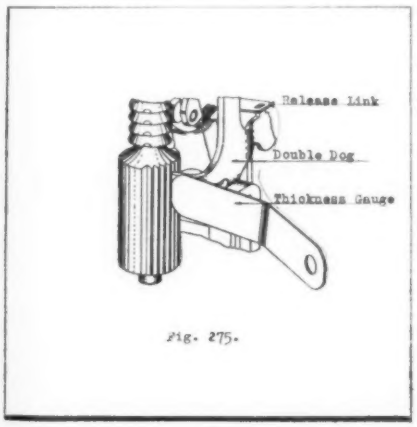


Fig. 275.

shaft was being rotated by the rotary armature, the spring at the upper end of the shaft was given increased tension. When the release magnet lifts the double dog out of the hub, the cup spring turns the shaft to the left again. The stationary dog tooth now carries the weight of the shaft and prevents it falling until the shaft rotates far enough to allow the stationary dog to again take its position as shown in Fig. 269. When the slot is reached the support of the shaft ceases, and it drops down to its normal position. During the release motion of the shaft the wipers are held in their normal position in the banks, and are brought out clear of the bank contacts before the shaft drops.

The sequence of the mechanical operations of the switch can be summed up as follows:

1. Vertical coils energized.
2. Vertical armature pulls up, and unlatches release link.
3. Vertical pawl drives into vertical hub, and lifts the shaft one step and locks.
4. Double dog has dropped into next vertical tooth, and holds shaft up.
5. Vertical armature releases, and shaft held by double dog.
6. Rotary armature pulls up.
7. Rotary pawl drives into rotary hub tooth, and locks shaft when the armature is full in.
8. Double dog slips over rotary hub tooth into next tooth.
9. Cup spring tension increased.
10. Rotary armature releases.
11. Double dog now holding against

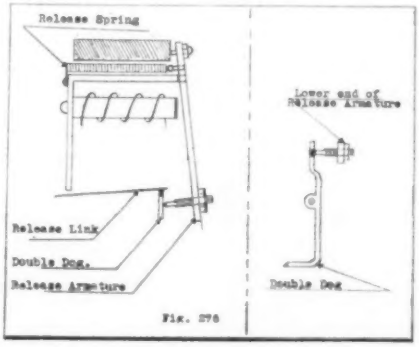


Fig. 276

both vertical and rotary teeth.

12. Release armature operates.
13. Double dog inner end driven in, while outer end with teeth is lifted out of the hub.
14. Release link locked over double dog projection, holding it normal.
15. Release armature restores. Copper residual on release coil prevents armature remaining operated.
16. Cup spring turns shaft back to left. Stationary dog holds shaft from falling.
17. Stationary dog tooth enters slot in vertical hub and shaft drops to normal.

In the above description of the mechanical operations of the Strowger selector or connector switch we have tried to convey some idea of the parts played by the different apparatus. In our next chapter we will incorporate these parts in the circuit required to ring the called telephone, and place in a talking position, and again release the connection.

Illinois "Silver Jubilee" Convention

The Illinois State Telephone convention held at the Abraham Lincoln Hotel, Springfield, Nov. 20 and 21, maintained its place as one of the big state conventions of the year. Not only was the attendance large but a varied and interesting program provided entertainment and instruction throughout the two days. From the time the welcoming address was made by Hon J. Emil Smith, mayor of Springfield, to the closing business session the main convention hall was crowded. At the same time, traffic sessions were conducted in other rooms, four sessions in parallel being required to handle the numbers in attendance.

The program arranged by Secretary A. J. Parsons and an efficient set of committees included matters not only of state but of national and even international interest. There was something for everyone in every department of the telephone business. Of general character were the addresses by F. B. MacKinnon of the U. S. Independent Telephone Association on "Maintaining the Average," by John N. Van der Vries of the Chamber of Commerce of the U. S. on "Supporting Your Trade Association," and by T. H. Ashley of the Bell Telephone Co. of Canada on "Connecting Company Relations."

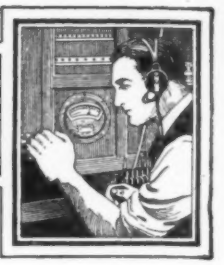
Matters relating to utility regulation were discussed in a paper by Ben B. Boynton, general counsel of the Illinois Association and in the address on "Utility Regulation," by Hon. Charles W. Hadley, chairman of the Illinois Commerce Commission. The management side of plant operation was presented in papers by J. W. Wopat, consulting engineer, Diversified Investments, Inc., on "Planning Exchange Construction"; R. V. Achatz, editor of TELEPHONE ENGINEER, on "Net Profits From Good Transmission," and E. R. Stonaker, traffic engineer of Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y., on "Furnishing Modern Telephone Service at a Profit." In the absence of Mr. Stonaker the latter paper was read by Dr. H. T. McKaig.

An interesting lecture and demonstration was given on "Improvement of Plant Maintenance Conditions," by Mr. G. R. Francis, transmission engineer of the Illinois Bell Telephone Co. Mr. Francis demonstrated many of the damages which might occur due to faulty conditions, particularly clearances from other electric wires.

The election of directors resulted in the re-election of retiring directors except E. S. Slusher of Macomb, who was succeeded by G. L. Mays of Murphysboro. The convention marked the "Silver Jubilee" of the Illinois Association and provided an excellent "get-away" for another quarter century of useful association effort.

Cutting long distance rates means cutting commissions at originating offices.

LINE AND DESK



TWO-PARTY SELECTIVE SERVICE FOR MAGNETO EXCHANGES

By W. C. White

A large number of the subscribers on magneto exchanges are being served on party lines. Especially is this true where line and cable facilities have become congested in residence sections ahead of the construction program. For economic and other reasons party-line service, to a certain extent, is desirable both to the operating company and its subscribers.

On many exchanges of this type the code system of ringing is being used, by which the desired party is called by two or more rings. When this system of ringing is used all the bells are bridged across the line and all of them are sounded when one party is called or calls central. From the subscriber's viewpoint code ringing has always been the most serious objection to party-line service. This objection can be overcome by the use of selective ringing in one form or another. The different systems now in use are satisfactory and the plant manager can decide for himself which type of selective ringing best meets his requirements.

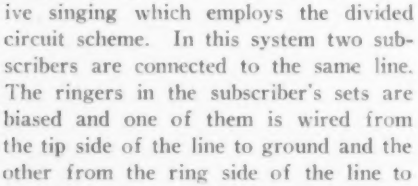


Fig. 1

The subject of this article is a very simple arrangement for two-party selective singing which employs the divided circuit scheme. In this system two subscribers are connected to the same line. The ringers in the subscriber's sets are biased and one of them is wired from the tip side of the line to ground and the other from the ring side of the line to ground as shown in Fig. 1. By the tip side of the line we mean the one which is connected to the short spring on the jack which makes contact with the tip conductor of the plug. The ring side is on the other contact of the jack and corresponds to the ring conductor of a 3-wire common battery cord circuit.

The drop at the central office is bridged and is operated by alternating current from the hand generator in the subscriber's set. The generator is of the two-bar type, or a three-bar generator from which the middle bar has been removed and is not heavy enough to ring the two bells on the line as they are biased and in series. The drop coil should be of a comparatively low resistance so as to absorb more of the output of the hand generator when the subscriber rings on the line to call central.

Triple inside wire is installed for all

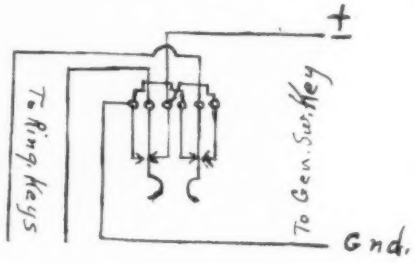


Fig. 2

stations where this system of ringing is used with the third, or yellow, conductor connected to the ground post on the lightning arrester and the side of the bell which is to be grounded by means of a special binding post inside of the instrument. If paired inside wire is already in place, and it is not desired to rewire the house, a single strand can be run beside the twisted pair.

The cord circuits at the central office are wired so that alternating ringing current may be sent out on either side of the line to ground by reversing the ringing current, one side of which is grounded, on the ringing keys. If the switchboard is not already wired for this service the most simple way is to install one master key for each operator's position. This key should be placed on the left hand end of the key shelf in line with the other keys. Figure 2 shows one form of this key with its wiring. In common practice it is wired so that when the master key is in normal position the regular ringing keys will ring from the ring side of the line to ground and when the master key is operated the ringing current is reversed on the ringing keys so that they ring from the tip side of the line to ground. One side of the operator's hand generator is grounded to correspond with the grounded side of pole changer or other source of ringing power. The master key is cut in between the generator switching key and the ringing keys.

With this service parties on the same line cannot call each other except through central.

Where this system of signaling is in use it should be kept in mind when making rearrangements or repairs that drop wires and jumpers have to go back just like they came off or one or both parties will be reversed. For that reason if one will form the habit of connecting tracer to tracer all the way through the plant, the tip and ring side of the line can readily be identified at any point.

If one of the biasing springs becomes loose that ringer will sound when the other party calls central.

One feature which commends this system of signaling to the plant manager is the fact that the same instrument may be used for either party by simply reversing the line connections, and it can be used equally as well for straight line service by bridging the ringer across the line in the usual manner.

A CALL FOR HELP

A subscriber writes us an inquiry that reads in part: "A friend of mine in a small town of 3,000 is building an exchange and has a hazy idea of placing a measured service using a five-cent slot machine, having no flat rate. Have you any information on such practice? Is it practical in a small community? How has it worked in other places?"

We could only answer that we know of no exchange in a community of that size where measured service is being given. There are a number of systems for collections of coins which might be applied, but whether the placing of the entire system on a coin collection basis would be successful we could not say. Perhaps some of our readers have had experience in that line which they would be willing to submit for the information of the querist.

Telephone Changes and Improvements

Riceville, Tenn.—Walter Carruth acquired Morrow Telephone Co., W. M. Morrow; now improve equipment.

Point Isabel, Tex.—Rio Grande Valley Telephone Co., J. C. Paxton, general manager, McAllen, acquired site for telephone exchange; install modern type telephone common battery system.

Grounding With Driven Electrodes

Practical Methods of Obtaining and Maintaining Reliable Low Resistance Grounds Is Discussed in This Very Able Article—Proofs Are Submitted

Probably the most important application of grounds is for protection, both in the communication and the power transmission and distribution fields, either for protecting and increasing the reliability of the circuits on which they are used, or for protecting life and other property. This use while not new is, nevertheless, of more interest now than ever before, mainly, because too often in the past, grounds have not been adequate for the purpose for which they were intended.

The earth may be considered as a conductor which has practically an unlimited capacity, and on account of its size, a negligible resistance, and any conducting material electrically connected to the earth will tend to have the same potential as the earth. The only limitation is in the electrical connection, or as is commonly known, the ground. The very simplicity of a ground has been one reason why it has not received the consideration which it should have. Like most other electrical connections, a ground should have low resistance, be mechanically secure, and permanent. It is possible to make grounds meeting almost any practical requirement. There are, however, economic limitations. For some installations, a fairly large amount of money may be invested to secure good grounds, while in others only limited expenditures are justified. However, in all cases it is desirable to have the best ground obtainable for the amount invested.

*A paper delivered at Plant Conference U. S. Independent Telephone Association Convention, Chicago, October 22-26, 1929.

Resistance

The first requirement for a ground connection is low resistance, and the lower the resistance the better protection it affords. In many instances, such as lightning arrester installations, the resistance of the ground is probably the controlling factor in the protection afforded by this equipment. It is important, therefore, to know just what are the factors which determine the resistance of grounds, are they depth, size of electrodes, material, contact area, soil, etc. It is with these questions in mind that a number of investigations have been made to determine the relation between the physical characteristics of driven grounds and their electrical properties.

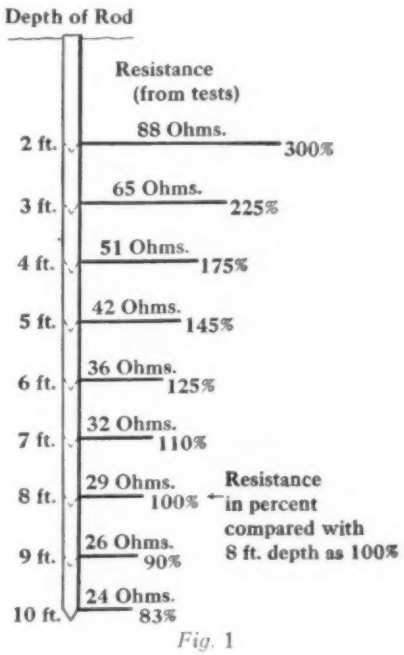


Fig. 1

The most important information obtained in these investigations is that the resistance of the ground connection is largely determined by the conductivity of the soil surrounding the electrode. This conductivity is dependent on the soil ingredients and the moisture content. It has also been shown that within practical limits the diameter and shape of the electrode, as well as its contact area only slightly effect the resistance at a given location and condition. This is in contradiction to the earlier ideas on grounding when the contact area of an electrode was considered the important factor. We now know that the contact resistance between a driven ground and soil is negligible, and that a large electrode area is in itself no reliable indication of the adequacy of a ground.

The important effect of the soil within a five to six foot radius of the electrode can be easily demonstrated. For example, consider a ⅝ inch by 8 feet driven ground which when installed has a resistance of 30 ohms. If a second electrode is driven immediately adjacent to the first and connected in parallel, there is only slight reduction in resistance, although the contact area has been doubled; whereas, if the second rod is driven at a distance of 4 to 8 feet from the first electrode, the resistance of the two in parallel is reduced about 40 per

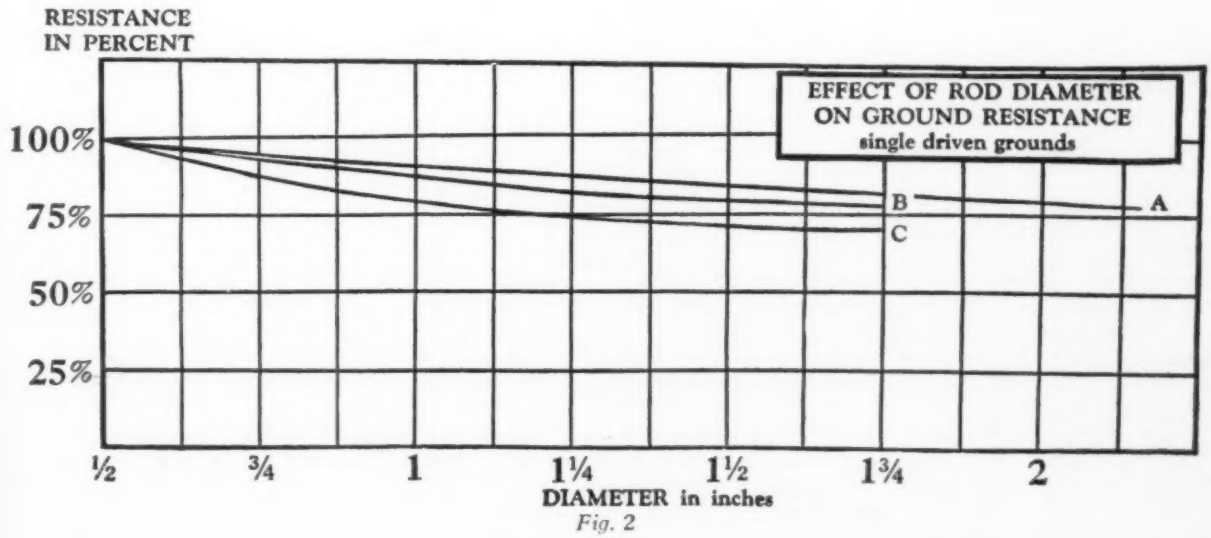


Fig. 2

cent or to approximately 18 ohms.

With the knowledge that it is the soil which determines the resistance of the ground, what is the desirable length and diameter for a driven electrode?

Length

Every driven ground should be long enough to reach permanent moisture. They should not be less than 6 feet in length, and a minimum of 8 feet is preferable. Longer rods may be used at times, but in most locations an 8-foot length reaches permanent moisture and the use of a longer rod is not commensurable with improvements obtainable by other means. The variation in resistance with depth are shown in Figure 1. With the first few feet, the benefit of additional depth is very pronounced, but the changes in resistance for depths greater than 8 feet are small.

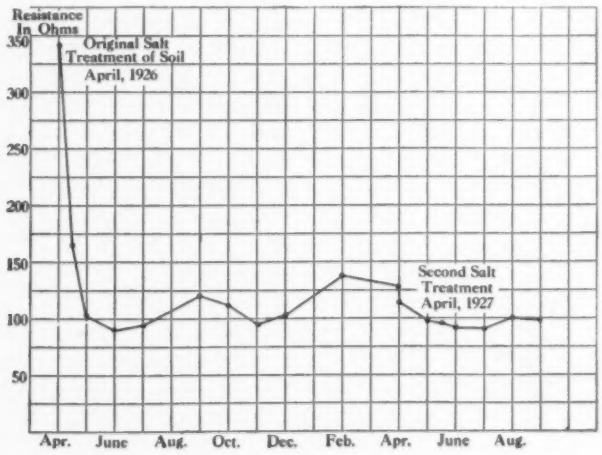


Fig. 3

In a few cases, particularly at station grounds, longer rods than 10 feet may be used; in many instances 20-foot rods being employed. The value of the other equipment justifies the use of every available means for obtaining the lowest resistance possible, but even here twice as many rods of half the length may furnish the better ground.

Diameter

The diameter of a driven ground should be no larger than actually required for driving purposes. Larger diameters add but little to the electrical efficiency of the ground. This is graphically shown in Figure 2. A ½ inch rod is satisfactory in most soils. Rarely are ground rods required larger than ⅝ or ¾ inch, even in very hard soils, except perhaps for lengths of 12 feet or more.

The resistance of grounds will not be the same at all times. The moisture content of the soil differs and there is also a noticeable effect due to variations in temperature. Figure 3 shows the variations which may be expected.

After installing a driven ground, or any ground in fact, there is only one way to determine the protective value, and that is by measuring its resistance. The resistance of every protective ground should be measured. Excellent portable ground resistance measurement instruments are now obtainable with which tests can be easily and quickly made. Exact determinations are not necessary, but it is important to know whether the resistance is of the order of 15, 50 or 200 ohms.

Where a driven ground has a resistance in excess of the desirable maximum value, there are several ways of improving this ground.

Multiple Driven Grounds

The simplest and generally the most practical method is to drive another rod 6 to 10 feet away from the first rod and connect the two in parallel. As shown in Figure 4, this reduces the resistance of the ground approximately 40 per cent. Additional rods may be used and these will decrease the resistance almost in proportion to the number of rods used.

Salt Treatment

Another means of improving a ground is by lowering the resistivity of the soil surrounding the rod. This can be accomplished by salt treatment of the soil, which in high resistance soils often results in reduction of 50 to 70 per cent. The disadvantage of salt treatment is that salt is gradually carried away by the water flowing through the soil and must be renewed periodically. However, where supervision and regular inspection of grounds is possible, this method is very satisfactory. Tests made during the last few years show that salt applications are beneficial for at least one to two years, and while the salt is partially carried away by water, there also appears to be some permanent improvement, especially after the salt has been renewed several times.

One method of treating soil is to dig a basin about the ground rod, approximately 2 feet in radius and 1 foot deep, as shown in Figure 5. About 60 pounds of coarse rock salt, such as ice cream salt, is placed in this basin and flooded with water until the surrounding earth is well saturated. The basin is then refilled with soil. In cities where paving clearance may interfere with the basin method, a hollow tile or pipe may be placed around or near the rod, as a receptacle for the salt. This latter has the advantage of enabling the inspector or tester to easily renew the salt.

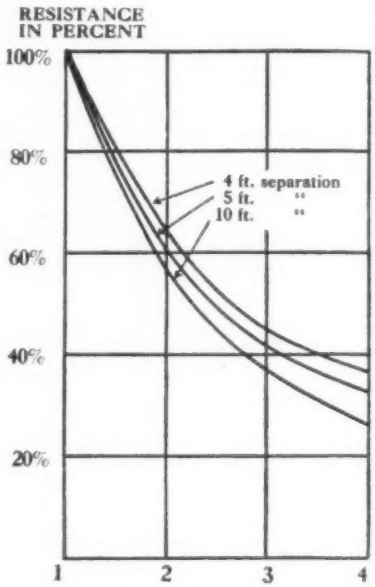


Fig 4

Reliability

(1) Making installations permanent.

Ground rods should be installed as permanently as possible, since a ground after once installed is generally accepted as adequate and maintenance is too often neglected. Grounds are often relied upon for electrical protection for almost an indefinite period. Only long life materials of ample size and ruggedness to withstand the effects of corrosion and possible mechanical abuse should be used.

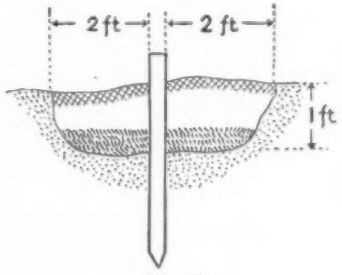


Fig. 5

For a good ground, the soil must contain moisture and an electrolyte, the latter usually being a soluble salt of some kind. Moisture and salt are corrosive agents and will, therefore, affect the life of the electrode. A wide variation in the corrosive action of different soils is to be expected. In general, however, corrosion will be greater in grounds which

(*Continued on page 32.*)

Teletype—The Telephone Typewriter

Written Communication System Now Used in Modern Business—Description of Teletype Machines and Purposes They Serve in Connection With Telephone Circuits—Paper Presented at Plant Conference During the National Convention

By A. S. BENJAMIN,
Sales Engineer, Teletype Corporation

Communication has been a vital factor in the development and expansion of business in the past few decades. Organizations doing business in small communities have developed into tremendous companies with offices, factories and warehouses scattered in various parts of a city and in many cases, different cities. It would be almost impossible to operate a large business with its branches widely separated without a proper means of communication to co-ordinate its divisions. Business is competing today on a basis of service and to render this service a communication system is required which is accurate, rapid and provides an authoritative and permanent record.

The most common means of communication are, of course, messenger service, the mails, the telegraph and the telephone.

Messenger service is greatly limited due to the distance that can be efficiently covered by a messenger. It is not uncommon to have messenger boys require an hour or so to deliver messages to points a short distance from an office. The mails, even with our limited trains and air service, require an appreciable length of time for delivery. Messengers and mail, although slow, can handle carefully prepared messages, thus eliminating any possibility of misunderstanding. This means of communication, however, does not provide personal contact with the recipient of the message.

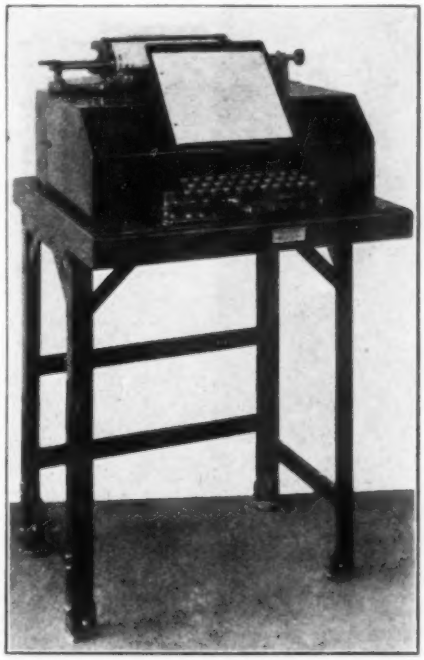
The commercial telegraph provides a rapid and highly accurate means of communication but it is comparatively costly and also lacks personal contact and flexibility.

The telephone provides a rapid and flexible means of communication. An analysis of telephone service, however, shows that it is more or less subject to misunderstanding and that it lacks authority in that no record of the message is available unless it is taken down by the person at the receiving end. The person with whom we wish to converse must of course be at his telephone, otherwise our business cannot be transacted.

It is therefore obvious that a system which combines the good features of all of the present means of communication would be an ideal one for modern business.

Teletype, the telephone typewriter, provides a system of communication which is rapid, accurate, flexible and one which produces an authoritative and permanent record. Teletype, as its name implies, is an instrument which permits sending of typewritten messages to distant points. The message is instantly and automatically recorded at the receiving point without the necessity of an attendant being present.

Teletype resembles and operates like a typewriter. It has a bank of keys, typebars and a platen similar to that found on a standard typewriting machine. When a number of Teletypes are interconnected by a system of wires, it is possible to transmit typewritten messages from one point to another. The depression of a key on the sending instrument causes a character to be printed on that instrument and at the same time it is instantaneously and automatically recorded on all other machines connected to the sending instrument.



Direct Keyboard Sending-Receiving Model 12 Page Teletype

There are two general types of Teletype receiving units—the Page Teletype, which records the message on an 8½ inch sheet of paper, and the Tape Teletype, which records the message on a ⅝ inch wide tape.

The Page Teletype will do practically everything that a standard typewriter will do except back space. It is not equipped with tabulating stops, although it is a very easy matter to send messages in tabulated form by merely spacing the carriage to the proper position on the page. In order to take full advantage of automatic reception on the page machine, rolls of 8½ inch wide paper are usually used on the instruments which permits the printing of a series of messages without an attendant other than one who tears off the messages from time to time.

When the page Teletype was first introduced for general business communication, messages were received on rolls of blank paper and in many cases the information was then transferred to special order forms by typists. In order to eliminate transferring information from Teletype records to forms, a special page machine was developed which makes it possible to send messages over a Teletype circuit and automatically record them directly on forms. In many cases this machine has made it possible to eliminate all typists from warehouses and similar places. Carbon copies can, of course, be made on the page Teletype.

The tape Teletype records its message on a narrow tape which is automatically and continuously fed through the machine. The tape machine is somewhat simpler than the page instrument and is being used for two important classes of service. One, where the messages are short and of a transitory nature, in which case the tape is reeled up on an automatic winder and references made to the message as it is printed. The rolls of tape can be filed for future reference and provides a permanent record which has been found so essential in modern business.

The tape machine also has been found applicable to the other extreme of service, that is, where the messages are comparatively long and a considerable amount of business is handled over the circuit. In that case gummed tape is used on the instrument and an operator pastes the tape to a message

Presented at U. S. Independent Telephone convention, October 23, 1929.

blank. This particular application of the tape machine has been highly developed by the telegraph companies.

Approximately 75 per cent of the messages handled by the Western Union Telegraph Co. and a large percentage of those handled by the Postal Telegraph Co. are transmitted over Teletype circuits. Although some page printers are being used, the telegraph companies are inclined to use tape reception because of certain economies. The tape Teletype is somewhat cheaper and simpler than the page instrument, giving a lower initial and maintenance cost.

Another factor is the saving in line time. When an error is made on a page receiver it is necessary to have the entire message re-run in order that a correct copy be available. In the case of the tape machine, it is very easy to rectify errors by sending the correction and pasting the corrected portion of the message over the part which has been incorrectly sent. The feeding of the paper and the returning of the carriage on the page machine is controlled by the sending operator. This requires certain signals and line time. These functions are not required on the tape printer and the line time can therefore be utilized for the actual transmission of messages.

There are two general methods of transmission. The simplest Teletype machine is equipped with a bank of keys, the depression of any one of which causes a series of impulses to be sent over the line and the proper character to be printed. This is the direct keyboard system of transmission and is the instrument finding general use in business practice. The second means of transmission is one where a perforated tape is first prepared on an instrument called the perforator, the tape then being passed through an automatic transmitting distributor which in turn sends out the impulses over the line and causes the printer mechanisms to function.

In case of the direct keyboard, the speed of operation is controlled entirely by the keyboard mechanism. If the maximum speed of the circuit is 60 words a minute, it will not be possible for the operator to manipulate the keyboard at any greater speed. Should the operator manipulate the keys at a speed lower than that of the circuit, the full capacity of the circuit would not be utilized.

In the case of tape transmission, the transmitting device is operated at a uniform speed and is not under the direct control of the sending operator. If the speed of the circuit is 60 words a minute, the maximum speed of the circuit can be utilized at all times since it is possible for the operator to perforate tape at a speed higher than that of the circuit. This makes it possible for the operator to keep a sufficient amount of tape perforated in order to keep signals going over the line at all times, e.g., the tape could be perforated at the rate of 70 words a minute for a certain interval and then at the rate of 50 words a minute for the same length of time, yet there would be sufficient tape perforated to send out signals over the line at a rate of 60 words a minute. It is therefore obvious that tape transmission is desirable where the number of messages to be handled over a circuit is exceptionally high and it is necessary to utilize full line time.

Inventors have been working on the development of printing telegraphs for more than 75 years. The present models of Teletype are the results of more than 20 years of development by specialists in printing telegraph equipment.

As business expanded, the use of commercial telegrams greatly increased and at such rapid rate that it was impossible for

Tape transmission sending only Model 12 page Teletype, New York office, Associated Press

the telegraph companies to provide facilities fast enough to take care of the increased business. Competent Morse telegraph operators were hard to get and wire facilities were costly. Communication companies therefore looked around for a more efficient means of handling messages in order to meet the increased demand for telegraph service.

Teletype was then introduced and solved the problem. It is very easy to train typists in telegraph routine. It was found that a Teletype operator using tape transmission could handle approximately twice as much business as could be formerly handled by Morse operators. Teletype, therefore, not only solved the labor problem but also introduced a large saving in line construction due to its high speed of operation. The accuracy of Teletype operation was found to be surprisingly high.

After years of successful service by commercial telegraph and railroad companies Teletype was offered to the business world for general business communication service. It is now used by practically every conceivable business, such as hotels, police departments, railroads, banks, insurance companies, airways, communication companies, news distributing associations, public utility companies, brokers, steel companies, department stores and innumerable other general merchandising and manufacturing organizations.

Telephone typewriter service is in reality a special form of telegraph service. Practically all of the communication companies have been selling Morse telegraph service for many years and should therefore have little difficulty with circuits arranged for telephone typewriter service since the wire facilities in both cases are almost identical. Superimposed telephone lines used for Morse service can with slight modifications be utilized for Teletype service.

It is possible to practically duplicate every type of telephone circuit. The simplest Teletype circuit is of course one which has a sending-receiving machine at one point and a receiving-only machine at the distant point. This permits the transmission of messages in one direction only. Circuits with sending-receiving machines at either end of the wire permit sending in either direction. Lines arranged for duplex operation makes it possible to provide Teletype apparatus at the terminal ends for simultaneous transmission of messages in both directions over a single channel.

Some systems are arranged with several machines on one circuit so that the operation of any sending machine on the line causes all the other instruments on that circuit to record the message. Control devices are available which permits any station to select any other station on the line in order to record the message at desired points without the other station receiving the message.

Systems can be arranged with a central transmitting point from which it is possible to send simultaneously to a large number of receiving-only machines. Such circuits are being used for police communication, news and stock quotation distribution, where it is desired to send information from one point to a large number of outlying stations.

One very interesting application of Telephone Typewriter service is police communication. Previous to the use of Teletype, sending out reports to all precinct stations involved calling in a large number of points and after the desk men at these points were in line, the message was given. It was necessary for each man to make a record of the message in longhand, during which time it was not possible for him to devote his time to anything else.

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tions. Their telephone system was originally laid out so that the messages were sent to seven district stations and taken down by operators at those points. They in turn would re-transmit the message by telephone to the precinct stations under their jurisdiction. This system involved setting up a large number of telephone connections, required the attention of 48 different men and necessitated their recording the messages in longhand. The introduction of Teletype for this service has eliminated all this work.

At the present time the operation of one switch starts up the motors on 48 instruments and the operation of the keyboard at the central station sends the messages to 48 points without the help of a single attendant at any of the receiving stations. A bell on the instruments indicates to the men on the premises that a message has been transmitted. It is only necessary to tear off the recorded message which takes only an instant.

When the telephone was used for this particular service, errors were innumerable. The color of criminals' eyes and clothes were invariably transposed, as well as the figures in automobile license numbers and similar information. It was impossible, because of the amount of time involved, to have 48 men check back to the central operator. Teletype makes an exact copy of the transmitted message at all points and if the sending operator checks his copy he can be reasonably sure that

Direct keyboard sending-receiving Model 14 tape Teletype

every point has received the proper information. The Chicago police system is arranged so that it is possible to select any one or group of circuits should it be necessary to send to any one circuit without the other stations receiving the message.

There are several systems in operation where two-way communication is provided between outlying stations and a central point. For example, the commercial telegraph companies install sending-receiving Teletypes in their various branch offices and connect them by wires to their main operating rooms where concentrator tables equipped with signal lamps and jacks are provided. When a branch office desires to send a telegram to the main office, a key is depressed at the branch office which operates a signal at the main office. The main office operator then connects her machine to the branch office circuit which permits the branch office operator to send the messages to the main office. If the main office has messages for the branch office it is merely necessary to connect a sending machine at that point to the proper branch office circuit.

There are also installations where it is possible for outlying stations to communicate with a central point and also to have the central operator manually connect them through to another outlying station. This type of installation is practically a duplicate of a manual telephone system.

Teletype has not only been found applicable for communication between widely separated points but is being used quite extensively between departments but a short distance apart. Hotels, banks, utility companies and most manufacturing plants have need for an intercommunication system over which recorded instructions can be sent. There are many Teletype installations at present which involve as many as 50 machines within a single building controlled by keys or through the medium of an automatic Teletype switchboard.

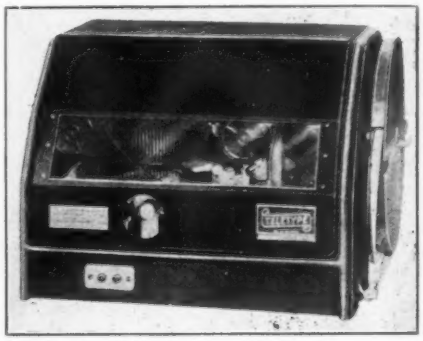
The Roosevelt Hotel in New York has an installation consisting of 22 sending-receiving machines and 28 receiving-only tape Teletypes. These instruments are connected to an automatic Teletype switchboard which is in reality a modified telephone P.A.X. At each sending machine there is provided a small dial box on which is mounted a dial, cam key and busy lamp. To select a station it is only necessary to throw the cam key which corresponds to lifting the telephone receiver from its hook and dial the proper digits which sends the selecting impulses over the line. If the called station is not busy, a connection is established. This is indicated by the motor on the sending machine starting up, which permits the operator at that point to transmit the message. Should the called station be busy, the motor on the sending machine fails to start and the busy lamp on the dial box lights up, giving a visual indication that the circuit is busy. The cam key is restored to normal and a connection again attempted later on.

It is obvious that the development of Teletype circuits has practically followed that of the telephone. As a further development, circuits are being arranged to give us service similar to telephone toll service. That is, subscribers are furnished with Teletypes and the exchange offices equipped with the proper type of switchboard which makes it possible for a subscriber to call any other subscriber who is equipped with Teletype. It is evident that this type of service provides the most efficient means of communication thus far developed.

An experimental exchange system was recently established by the American Telephone & Telegraph Co. between switchboards and telephone company offices in New York, Boston, Chicago and some adjacent cities. When placing a call the subscriber switches on the power at his station which is analogous to lifting the receiver from the hook. This operation lights a line lamp at the telephone typewriter switchboard. The operator responds by connecting his instrument to the calling subscriber's line and is advised as to the subscriber's requirements. The operator then connects through to the switchboard in the called subscriber's city and the operator at that point establishes the final connection.

Automatic switchboards arranged for trunking are now under development.

Teletype is being operated by radio, one interesting application being a circuit between New York and London



Direct keyboard receiving only Model 14 tape Teletype

used for handling service messages and other details necessary for establishing telephone connections for the trans-Atlantic telephone service. Very satisfactory results are being obtained on this circuit.

Until about five years ago Teletypes were sold direct to the ultimate users for general business communication. The purchaser in those cases found it necessary to assume the responsibility of obtaining wire facilities when required and to provide maintenance for the instruments. The maintenance problem became one of great importance since a number of machines were sold in areas where the manufacturer did not have service offices. In those cases the purchaser had men in his organization trained to handle the maintenance but in view of the fact that employes come and go, it was almost impossible to keep a trained man available for this work at all times.

What the ultimate user of Teletype is interested in is communication service. It was therefore decided to sell a service

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In the service of all the people

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It is a democratic instrument of a democracy. Big and little, rich and poor, can project their personalities over the wide network of its wires. For friendship or business, pleasure or profit, the telephone is indispensable to our modern civilization.

This year the Bell System is erecting new telephone buildings in more than 200 cities. It is putting in thousands of miles of cable, thousands of sections of switchboard and hundreds of thousands of new telephones. Its expenditure for plant and improvements in service in 1929 will be more than 550 millions of dollars—half again as much as it cost to build the Panama Canal.

This program is part of the telephone ideal that anyone, anywhere, shall be able to talk quickly and at reasonable cost with anyone, anywhere else. There is no standing still in the Bell System.

rather than the instruments. Since Teletype service is a communication service the logical organizations to handle it are, of course, the telephone companies.

This brings up the matter of maintenance which is one of the important factors in the service. Teletype, being a mechanical device, requires a certain amount of maintenance. The Model 12 Page Teletype and the Model 14 Tape Teletype, which are finding extensive use in business communication at the present time, are produced in large quantities and are not, as many people might think, in the experimental stage. In the development of these two models, continuity of service with a minimum amount of attention has been given every consideration.

Teletype requires intelligent supervision and proper inspection at certain intervals. It naturally must be oiled, kept clean and certain major adjustments checked, and should a case of unusual trouble develop, the man responsible for the maintenance of the instrument must be well versed in the operation of the machine to quickly find the trouble and make the proper repairs. It has been found that it is a very easy matter to train men with experience in telephone maintenance in the theory, operation, maintenance and installation of Teletype. The experience of the telephone companies, Western Union and Postal Telegraph companies indicates that there should be no difficulty on the part of the independent companies in setting up the proper routines and training their men for the maintenance of this apparatus. The manufacturers of Teletype maintain a large school of instruction at their plant in Chicago. This school is available to all telephone companies for the training of their Teletype maintenance men.

The demand for telephone typewriter service has been rapidly increasing during the past five years and an analysis of future requirements indicates that there will be still larger demands for the service. An article by Mr. R. D. Parker in the July, 1929, Bell Telephone Quarterly discloses the following interesting data regarding the use of telephone typewriters by the Bell System:

	Page printers in operation	Tape printers in operation	Total number of printers in operation	Miles of long line printer circuits not including associated company lines
1925	1,000	....	1,000	70,000
1926	1,500	....	1,500	90,000
1927	3,000	100	3,100	175,000
1928	5,000	1,500	6,500	280,000
1929 (est.).	9,500	6,500	16,000	.....

The following table shows the approximate number of Teletypes which have been produced by the Teletype corporation since 1918:

	Totals
1918 to 1927.....	15,500
1928	12,700
1929 (last 3 months, estimated)...	25,200
	53,400

Grounding with Driven Electrodes

(*Continued from page 26.*)

have the best electrical characteristics, since the latter is an indication of high moisture and salt content.

The electrical connection between the grounding wire and the driven ground is especially important. A high resistance connection or an insecure contact may alone nullify the benefits of the grounding and create a hazard instead of a protection.

While a certain investment must be made to secure a proper ground, the amount of money spent is not always an indication of the value of the ground. Both material and installation costs must be considered. The large saving in labor cost has promoted the general use of the driven electrode, but considerable money may still be wasted in using larger diameter electrodes than necessary. Costs of electrodes increase approximately as the square of the diameter. Further, larger diameter rods cost more to install. Where one man with a 5-pound hammer might install a ½ inch rod, it takes two to three men fully twice as long to drive a 2 inch electrode, even when armed with a 14-pound sledge. In order to have the most for the money invested, use diameters as small as meet the driving requirements. Two driven grounds of small diameters connected in parallel will cost less than a single large ground and will be more efficient.

Summary

To secure the most effective and economical installations with driven grounds the practical items to consider are:

1. Select a length which will reach the permanent moisture level, usually 8 feet.
2. Select a diameter of driven ground as small as its driving qualities will permit for the particular soil.
3. Measure the resistance of all protective grounds.
4. If a single driven ground does not show an adequately low electrical resistance for the purpose intended, proceed progressively in the following order:

(a) Drive a second rod, separated at a distance of from 5 to 10 feet, and connect them in parallel.

(b) Drive additional rods as may be justified from the standpoint of electrical necessity and cost.

(c) Use salt treatment of the soil.

New Switchboard for Flora, Indiana

F. M. Lantz, manager Indiana properties of the United Corporation of Abilene, Kansas, announces the purchase for Flora, Indiana, of a three-position Stromberg-Carlson Junior multiple switchboard with the necessary central office equipment and central energy telephones. The outside wire and cable plant will be put in the first class condition to operate on central energy system.

The various other Indiana properties are being studied with a view of giving first class telephone service and probably some of them will later be changed to central energy.

J. S. Cave Made Chief Engineer at Caracas, Venezuela

Announcement has been made of the recent appointment of J. S. Cave as chief engineer for the Venezuela Telephone and Electrical Appliances Company at Caracas, Venezuela. Mr. Cave assumed the duties of his new position on November 1st of this year, having arrived in Caracas following a brief trip to London, where he went to confer with interests identified with the Caracas company.

J. S. Cave

Mr. Cave's experience has been varied and thorough, and includes ten years of maintenance and engineering work in Dayton, Canton and Youngstown, Ohio; six years of engineering experience in connection with transcontinental lines, and three years in appraisal and general engineering work with the Snook-Hillhouse Company. For the two years previous to his present connection, he was chief engineer for the Standard Public Service Company at Columbus, Ohio. The telephone system of the city of Caracas has recently been converted to Strowger dial operation, and it is expected that the policy of modernization of its equipment entered into by the telephone company there, will be further continued under Mr. Cave's direction.

"MECHANICAL PROPERTIES OF CERTAIN WOODS USED FOR POLES"

Mechanical Properties of Certain Woods Used for Poles
Compiled by Engineering Department of
J. F. Prettyman & Sons Wood Preserving Plant Charleston, S. C.
July, 1929
Bulletin No. 2
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Firm_____

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Takes Ray Blain to Task

Claud L. Matthews, Vice President W. N. Matthews Corporation, Prominent Anchor Manufacturer, Differs with Ray Blain's Article in October Issue of Telephone Engineer. Here Are His Views and Proofs.

St. Louis, U. S. A., Nov. 29, 1929.

Mr. J. A. Smith,
President and Treasurer,
Telephone Engineer
192 North Clark Street,
Chicago, Ill.

My Dear Mr. Smith:

My absence in England during the months of October and part of November, 1929, prevented me from seeing, before this time, the astonishing article by Ray Blain entitled "Open Wire Pole Line Construction," starting on page 29 of your October issue.

It is astonishing from several points of view. First, either Mr. Blain has had little or no experience in anchoring poles to the ground or he has purposely written an article which by inference, at any rate, would tend to cause the reader to conclude that patented anchors of the plate type were far better than screw, expanding or cone type anchors. Second, it seems strange to us that he should offer you such an article without submitting it to someone who had expert knowledge on the subject. For example, he might have sent it to the Kearney Corp., who have a quarter page advertisement on the front page of your October issue, in which they are paying you good money for the space they are buying to extoll the advantages of their expanding anchors which are not installed in the way that Mr. Blain illustrates in his drawing on page 29.

He might have submitted it to Mr. Chance, whose full page advertisement showing screw, expanding and cone, as well as plate anchors, appears on page 2. He would have told Mr. Blain that his drawing does not apply to either his cone or expanding anchor. He might have written to us, particularly as our full page advertisement on page 3 advertises a new type screw anchor with 50 per cent more holding power. We could have given him actual reports of test after test all over the country where Matthews Scrulix Anchors have broken the ⅝ and ¾ inch steel rods without moving the anchor. As manufacturers of screw, expanding and plate anchors we could also have told him that the ideal situation depicted in his drawing showing a pole anchored by a plate anchor cannot be obtained in actual practice more than 1 per cent of the total cases. We could have pointed out to him that instead of right of ways for pole lines having 30 feet from the base of the pole they are lucky if they have 10 to 15 feet. We would have ventured the statement that there are many more anchor guy wires running at 60 degrees than 45 degrees from the ground line to the point of attachment on the pole. We would have sent him back his drawing and showed him how it would look if a Matthews Traplox Anchor (plate type) had to be installed to be efficient when necessary to anchor a 60 degree guy wire. (You will find one attached.) Note the kind of a hole the men would have to dig. Also note that they would have to start the hole 26 feet from the base of the pole in this case and 30 feet from the base in Mr. Blain's case (assuming that the guy wire in each case attaches to the pole 18 feet above the ground). Our experience is that the men will not put down a hole at less than a degree or two under 45 degrees because it is too hard and too uncomfortable to put it down at a smaller angle. On the other hand, it is less difficult to put the hole down 50 to 60 degrees from the ground line.

Now let us suppose that you give your men our plate anchor or any other plate anchor and the guy wire must be installed at 60 degrees from the ground line as shown in B or C. They won't install it as shown in B unless your foreman stands over them and makes them do it. This hole is in at an angle of 30 degrees from the ground line. They will put it in at 45 degrees as shown at C (or more). On many tests that we have witnessed, when a plate anchor is installed as shown in C, the anchor will cut its way out of the ground as shown by the dotted line and arrow in C.

If your editors would care to make an investigation it will probably develop the fact that 40 to 60 per cent of the total pole anchorages used are not patented anchors. Logs, concrete slugs and creosoted wood blocks will take up this 40 to 60 per cent. In most cases the companies would save money and get as good or better anchorages if they would adopt patented anchors. Fifteen years ago 75 per cent probably did not use patented anchors. So much for Mr. Blain's opening paragraph.

In his second paragraph Mr. Blain damns the screw and cone anchor with faint praise by stating, "While a screw or cone anchor may be entirely satisfactory for storm guys, these should not be used on a heavy corner or other heavy pull, but an expanding type should be selected."

In the thirty years that we have been selling screw anchors well over a million have been purchased. A very large majority of them have been used for anchoring other than storm guys. Hundreds of telephone, power, telegraph, railroads and other pole using companies use them. Hundreds of tests have been made where the dynamometer records show that they have held from 5,000 to 20,000 pounds, depending upon the size used, depth of installation, kind of ground and size of rod. How would Mr. Blain install a plate, cone or expanding anchor in quicksand, swampy ground, dry loose sand, or under shallow stands of water? Thousands of Scrulix anchors are used annually for pole anchorages under these conditions. If they were only good for light storm guys, how could the Bell and Independent engineers, and great engineering firms such as Stone & Webster, Day & Zimmerman, J. G. White & Co., Ford, Bacon & Davis, Phoenix Utility

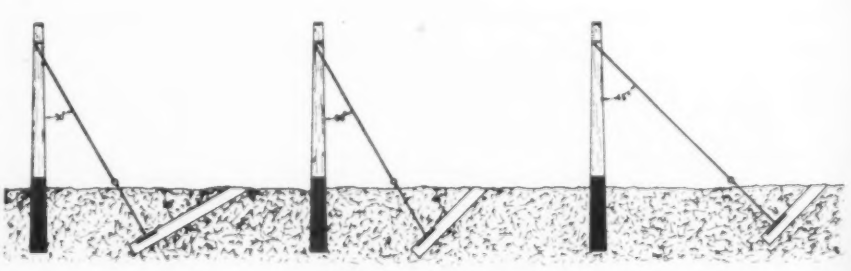


Fig. B
30° from ground.
30° hole.

Fig. C
30° from ground.
45° hole.

Fig. A
45° from ground.
45° hole.

Crapo
GALVANIZED PRODUCTS

The pure zinc coating on *Crapo* Galvanized Telephone Wire and Strand is *non-peeling, non-cracking*. Even when subjected to splicing, twisting or bending, this protective coating remains uninjured.

That is why *Crapo* Galvanized Products are outlasting all others in actual service. That is why users, year after year, are reducing maintenance costs to new low levels....

Crapo Galvanized Telephone Wire and Strand can be obtained from representative Jobbers. Insist upon *Crapo* quality! You can identify it by the *Crapo* Tag....

Indiana Steel & Wire Co.,
Muncie, Indiana

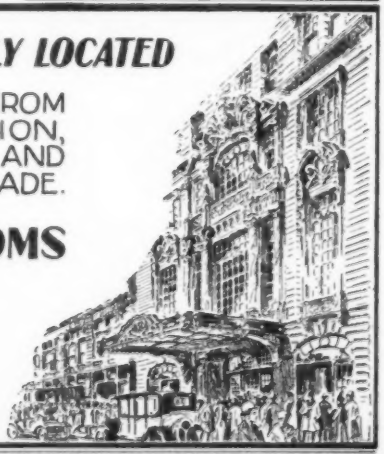
HOTEL ATLANTIC
Famous for food
CLARK ST. NEAR JACKSON BLVD.

MOST CENTRALLY LOCATED

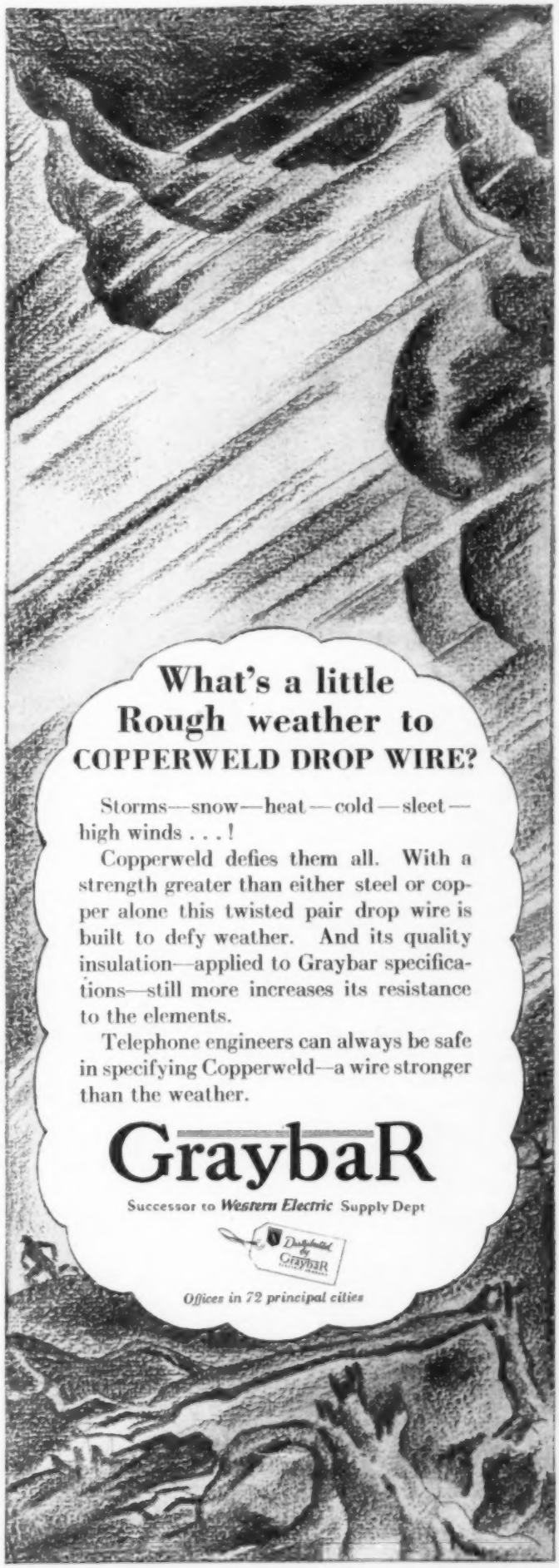
ONE BLOCK FROM LASALLE STATION, POST OFFICE, AND BOARD OF TRADE.

450 ROOMS
$2.00 UP

WRITE FOR FOLDER



CHICAGO



What's a little Rough weather to COPPERWELD DROP WIRE?

Storms—snow—heat—cold—sleet—high winds . . . !

Copperweld defies them all. With a strength greater than either steel or copper alone this twisted pair drop wire is built to defy weather. And its quality insulation—applied to Graybar specifications—still more increases its resistance to the elements.

Telephone engineers can always be safe in specifying Copperweld—a wire stronger than the weather.

GraybaR

Successor to *Western Electric* Supply Dept

Distributed by GraybaR

Offices in 72 principal cities

Tune in on the Graybar hour: 9 to 9:30, every Saturday night, Eastern Standard Time . . . . Columbia Broadcasting System.

Co., and many others countenance the use of screw type anchors in such ground for holding corners and deadends or important telephone and power lines?

Can Mr. Blain tell us how he would economically install a plate, expanding or cone anchor in disintegrated rock, hard baked clay ("adobe," "hardpan" or "Gumbo")? Does he know that Scrulix anchors can be installed in these difficult grounds quite easily by first using the Matthews Hingelox Auger with which one man can quickly drill a 3¼ inch pilot hole 4 or 5 feet deep, and then two men can screw down a Scrulix anchor 4 or 5 feet deep very quickly? Does he know that under these conditions that the ⅝ or ¾ inch rods will break every time without budging the anchor a fraction of an inch. They will. Test after test has proven it.

Mr. Blain apparently does not know that Scruhx anchors are used all over the Mississipi Valley in ordinary loam where all four types of anchors can be used, and that they are holding corners and deadends on important telephone, signal, telegraph and power lines. In many cases the companies made tests on them and found that they could be depended upon for strains between 5,000 and 15,000 pounds, depending upon size of helix and rod used, kind of ground and depth of installation. In recent tests made near Beaumont, Texas, in soft loam, an 8 inch Scrulix anchor was installed, 4 feet, and another new type 8 inch Scrulix anchor was installed 6 feet by the same men about 10 feet from the first. Strains were placed on each in turn and measured by a dynamometer. The first held 8,000 pounds and came out. The second held up to 16,000 pounds and the rod broke. In a recent test made near Fresno, Cal., an 8 inch Scrulix anchor held 8,500 pounds in sandy loam installed 4½ feet. Within 20 feet of it a plate anchor 8 by 20 inches was installed 6 feet deep and it skidded out of the ground in the manner shown in Figure C, when a strain of only 3,500 pounds was placed on it. That is one of the reasons why we sell more Scrulix than we do Traplox (plate) anchors. And yet, where ordinary clay is encountered, not too hard to bore an 8 inch auger hole and where there is sufficient right-of-way room to get the ideal conditions shown in Mr. Blain's drawing, nothing will hold more than a properly installed plate anchor. The main thing against them, as we have found with our Traplox, is, first, lack of right-of-way room; second, difficulty of getting the men to put the plate in so that it is exactly at a right angle to the line of strain; third, difficulty of driving the rod into the center of the hole and not getting the wrong angle shown in Mr. Blain's dotted rod.

These troubles and objections do not exist with the expanding, cone or screw type anchors. In the case of the first two, Mr. Blain must know that the 8 inch or larger hole which it is necessary to bore before they can be used is not bored towards the pole as shown in his drawing. His statement that "All patent anchors other than the screw type are set in a similar manner," does not apply to them at all, except insofar as the auger used is the same as the one he describes in his next sentence. Your youngest reader must know better than this. Kearney, Matthews, Chance, Everstick and a number of other expanding anchors are all installed in 8 inch holes or larger but the holes are bored *in line with the guy wire*, not at a right angle to the guy wire. This is also true of the four or five different makes of cone anchors.

Expanding anchors are splendid as to holding power when they can be expanded—that is, when the ground is not too hard to prevent them from being expanded at the bottom of the hole either due to breakage of the expanding mechanism or resistance of the ground to the expanding force. One must also be sure that the men put them down to their full depth. This cannot be determined by the inspector after installation unless a good strain is placed on them; he should be present to see that they have been put down at the proper depth and then properly expanded. That is why so many engineers prefer the screw type anchor, because the amount of rod visible above the ground line tells how deep it is, and as it has no parts to be adjusted you do not have to worry about the anchor itself if it is down the proper distance.

If Mr. Blain had ever witnessed one-tenth of the tests that we have where a properly set cone anchor had broken all of the pulling tackle available or the rods attached to them, he wouldn't, by inference, recommend them only for storm guys. Properly set, a good cone anchor, in good firm ground, will outhold any patented anchor that we have ever seen tested. The only reason more of them are not used is the difficulty of getting and transporting to the job the proper kind of crushed rock; the fact that the anchor must be set at the proper depth and the rock properly tamped in around it before filling the hole; the fact that where the ground gets excessively wet the continuous line lurch will tend to cause them to "hammer" the rock over into the sides of the wet ground and cause them to creep up. They are the best of the anchors from a holding power standpoint when properly installed in firm ground and will nearly always outhold any other type in a competitive test. Neither the expanding or the cone type of anchors can be installed economically in swampy ground, quicksand, dry loose sand, under shallow stands of water or in very hard baked clay ("adobe," "hardpan," "Gumbo" or disintegrated rock). Screw type anchors can be and are used where these conditions exist.

I might interpose here that I am not boosting the screw type anchor just because we make and sell more of them than we do plate or expanding anchors (we don't make cone anchors, but will if anyone will give us an order for 1,000 or more); nor because we were the first to put the screw type anchors on the market 30 years ago but because there are at least four manufacturers who have added a line of screw type anchors to their other types since the original screw type patents expired about seven years ago. (Three of these companies are now advertising in your pages.)

Mr. Blain will have a hard time proving his general statement in his ninth paragraph: "When the strain is applied to a properly set anchor the lines of force radiate at angles of 45 degrees." That statement is only true of Scrulix anchors or other screw type anchors having the same pitch to the helix and to cone anchors. It does not apply to the plate or expanding anchors—ours or any others.

In his closing paragraph on anchors he goes out of his way to direct attention to a recent addition to "a certain patent anchor ..... to hold the nut on the rod to permit the recovery of the rod if the anchor is abandoned, etc." Our expanding and plate anchors have always had this feature and our Scrulix anchors have had it for 20 years. Now, Mr. Smith, I think that this article of Mr. Blain's has done all of your anchor advertisers damage. I think that it is biased. I think that it should not have been printed as written and illustrated. I think that in justice to us, in justice to your readers, and in justice to yourself you ought to publish all of this letter and the revised drawing I am attaching in the first possible issue of TELEPHONE ENGINEER.

Sincerely yours,
W. N. MATTHEWS CORP.,
Claud L. Matthews,
Vice-President and Treasurer.

Long Distance Telephone Rates to Be Cut January 1

Reductions in long distance telephone day rates, which it is estimated will save the public $5,000,000 annually, will be in effect here January 1, 1930.

The new rates affect "station to station" calls—that is, calls on which you are willing to talk to anyone at the called telephone.

The last long distance rate reduction was effective February 1, 1929, and similarly meant an annual saving of about $5,000,000 to the public.

SOMETHING NEW

We wish to announce that our new "Stewart" Test Set is now ready for delivery.

New circuit with new and better testing features.

Tell which way and how far the trouble is from you without opening the line.

Now made lighter, stronger and better than ever.

Has head band, carrying straps as well as all cords for testing.

The detector coil is now the most convenient ever designed.

Sent on trial. Write for literature.

We also make

Cable Testers, Test Cabinets, Pocket Phones and Detectometers.

STEWART BROTHERS

OTTAWA - ILLINOIS

For Every Job

Dependable battery operation is imperative to uninterrupted telephone service.

Exides are dependable. Thirty-five years of service in the telephone industry have proven that. Dependable Exides assure a long life of satisfactory service.

DEPENDABLE EXIDE BATTERIES

Exide BATTERIES

The Electric Storage Battery Company

Philadelphia Penna.

Get EVER-PROTECT aid in your construction.

EVER-PROTECT has proved practical and profitable in making many hundreds of cable installations underground without a conduit. It protects cable against storm damage, corrosion, chemical action, electrolysis and abrasion.

In liquid form EVER-PROTECT is great for overhead work, protecting your cable and messengers against chemical action and other destructive influences.

Ask your nearest jobber for complete details.

EVER-PROTECT CABLE COMPOUND

TRADE MARK REG U S PAT OFF

National Cable Compound Co.

Incorporated

MITCHELL - - IND.

×3

×6

Note Protection at Corners

Blake Insulated Staples

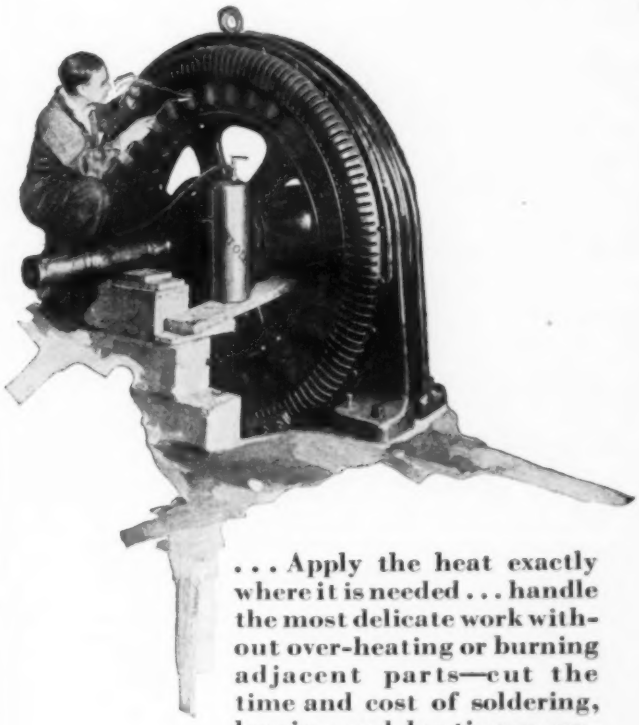
Trade Mark

Unequalled for telephone and bell wiring. The fiber insulation prevents troublesome short circuits and grounds. 4 sizes. Pat. Nov., 1900. Write for samples.

Blake Signal & Mfg. Co.

BOSTON, MASS.

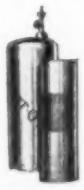
Any Flame You Want With Prest-O-Lite



. . . Apply the heat exactly where it is needed . . . handle the most delicate work without over-heating or burning adjacent parts—cut the time and cost of soldering, brazing and heating operations and do a better job.

Blow-torch operators prefer Prest-O-Lite. They like its hot, concentrated, easily controlled flame. They like its convenience, its instant readiness without pumping and preheating.

Ask your local Prest-O-Lite Gas Distributor to demonstrate this equipment for you or write us direct for complete information.



Any one of 15,000 Prest-O-Lite Exchange Stations can supply you quickly with Prest-O-Lite.

THE PREST-O-LITE CO., Inc.

Appliance and Small Tank Division

Unit of Union Carbide and Carbon Corporation

UCC

NEW YORK: Carbide and Carbon Bldg.
SAN FRANCISCO: Adam Grant Bldg.
IN CANADA: The Prest-O-Lite Company of Canada, Ltd., Toronto

Prest-O-Lite GAS

Missouri State Convention Up to Usual Interest

The annual meeting of the Missouri Telephone Association, held at the Hotel President, Kansas City, November 13th and 14th, maintained its record for business transacted and re-electing its former president and secretary. These very faithful and efficient officers have held their positions for many years. President Houck McHenry was presented with a plaque of very artistic design. The plaque consists of a base of beautifully finished walnut and upon it is engraved: "To Houck McHenry from Missouri Telephone Association to Commemorate the Anniversary of Twenty-five Years of Loyal and Faithful Service." The presentation was made on behalf of the association by M. L. Golladay of Holden, Mo.

The program consisted of very able discussion on various subjects. Extracts from a talk by E. R. Stonaker, consulting traffic engineer, Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y., are printed elsewhere in this issue. The plant conference attracted considerable interest because of the many appropriate subjects on the program. Some forty plant men were in attendance and paid close attention to the entire program. Some of the subjects discussed were: Outside construction; pole line construction; buried U. D. cable compound; subscriber's station installation; importance of maintenance; rural lines and their troubles; clearing trouble; common battery switchboards; painting old aerial cable. The subjects were discussed by different parties and brought out many new ideas.

About 300 registered during the sessions. The banquet was the social feature of the meeting and was attended by over 300 guests.

E. R. Stonaker, consulting traffic engineer, and E. A. Reinke, chief sales engineer of Stromberg-Carlson Telephone Mfg. Co., attended the Missouri Telephone Association convention at Kansas City November 13 and 14.

Mr. Stonaker gave an address on "Furnishing Modern Telephone Service to a Small Community at a Profit."

In his speech Mr. Stonaker explained to the owners and managers of small exchanges that with the installing of central energy equipment that they could furnish their customers up-to-date service and make a profit.

Mr. Stonaker pointed out the usual central energy lay-out has been much too expensive for the small exchange to consider. He stated that obtaining profit from selling telephone service of any type to small communities at present-day operating costs is an outstanding problem to the telephone operating man.

"The Junior Multiple Switchboard has solved this problem with the better class of telephone service it affords. By installing a Junior Multiple and giving the public better service, a general increase in rates can be secured, resulting in greater profits to the operating company. Furthermore, subscriber lists are more apt to increase than to decrease under these conditions, because today the public demands up-to-date service, the cost being a secondary consideration," Mr. Stonaker said.

Mr. Stonaker and Mr. Reinke both reported they found telephone business in the southwest the best they had ever seen it.

Made Vice-President Indiana Bell

Russell C. Rottger, former general manager of the Danville branch, Illinois Bell Telephone Co., is now vice-president of the Indiana Bell Telephone Co. He assumed his new duties November 1 in the general offices of the company in Indianapolis.

Mr. Rottger, who was in charge of the Danville office for several years, was promoted to the position of assistant vice-president of the Indiana Bell Telephone Co. last spring, and assumed his duties on May 1. He was elected vice-president of the board of directors at a meeting held October 24.

The former Danvillean's new position places him in charge of public relations, publicity and advertising.

During his residence in Danville Mr. Rottger was prominent in civic affairs and service organizations. He was succeeded here as general manager of the local branch by L. L. Thomas.

George S. Gardner Placed in Charge of South American Construction Work

Mr. George S. Gardner has recently been made superintendent of construction by the construction division of The Automatic Electric Company, Ltd., of Chicago, for its toll project in Colombia, South America. Under arrangements which have been made, this toll line will connect the cities of Buena Ventura, Cali, Palmira, Buga, Cartago, Pereira, Manezales, Armenia, Ibague, Giradot, Bogota and intermediate points in Colombia.

George S. Gardner

Mr. Gardner has a long record of successful activity in the telephone field. He has acted as superintendent of construction on some of the largest jobs of telephone and toll line construction completed in the Ohio area. During the last several years he has been in general telephone engineering and appraisal work, both for himself, and with Gustav Hirsch, well known consulting engineer of Columbus, Ohio. The increasing development of telephone facilities and other public utilities in Colombia, and the growing business importance of that country, make this new toll project of which Mr. Gardner will have charge, of considerable interest and importance in the telephone field.

Celebrates Greatest Month in History

More than 250 foremen, sub-foremen, department heads and officials of the Stromberg-Carlson Telephone Mfg. Co. recently celebrated the biggest business month in the company's history, which covers a period of more than 35 years, at a banquet in the plant dining room. This banner month was October.

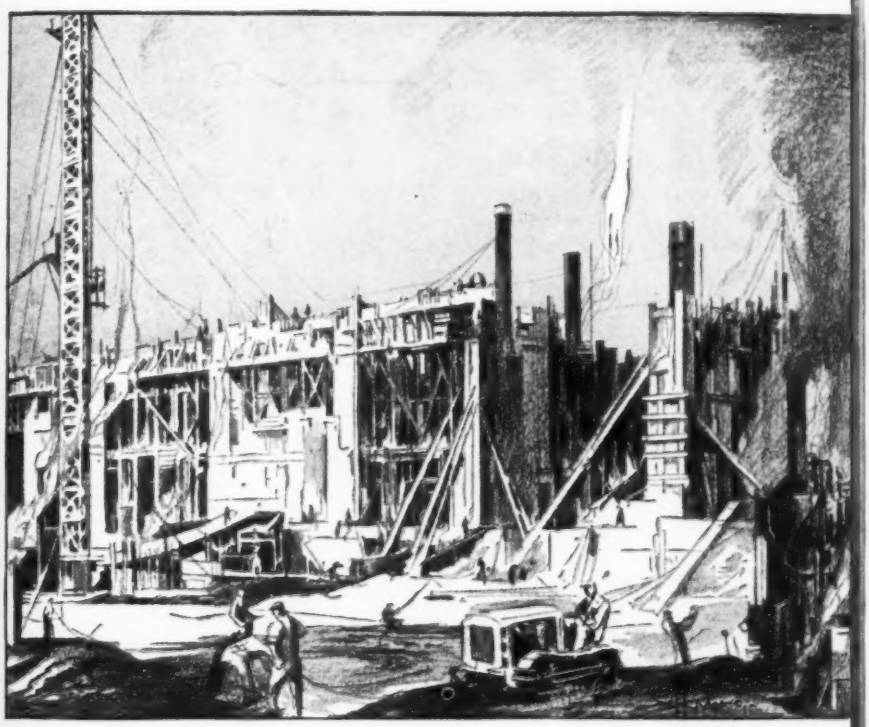
Wesley M. Angle, vice-president and secretary, was toastmaster. Speeches were made by Ray H. Manson, vice-president in charge of engineering; Edward A. Hanover, vice-president in charge of manufacturing; George A. Scoville, vice-president in charge of sales, and W. Roy McCanne, president and general manager.

In 1917 a similar banquet was held to celebrate the biggest month up to that time. The business last October, according to company officials, exceeded that month in 1917 by ten minutes, or an increase of 1000 per cent.

Woodpeckers Not the Only Hazard

Edgerton, Minn.—Special: All telephone connection from the south were severed, when workmen digging a ditch at the south end of the Main street, at the railroad crossing, cut the underground telephone cable in two. The workmen in digging the ditch came on the 202-wire lead underground cable, about three feet below the surface of the ground. Thinking it was the root of a nearby tree, they cut the cable in two with an ax.

More *and still more* telephones for tomorrow



Your voice starts new factories a-building

Day by day, the telephone becomes a more significant factor in social and business intercourse. As a means of communication on land and across the ocean, its use grows steadily and it is soon destined to become an accepted adjunct to travel in the air.

More and more equipment will be needed—telephones by the million, copper wire by the millions of miles, parts and accessories ranging from delicate springs to giant reels of cable, from the simple transmitter mouthpiece to the highly complex telephone switchboard.

To meet this program of expansion Western Electric's manufacturing facilities are being doubled. Huge additions to plants at Chicago and at Kearny, N. J.—a new factory at Baltimore—all this is evidence that however great the demand for telephones in 1930 or 1940, that demand will be satisfied.

In homes

In offices

In airplanes

Across the ocean

This busy scene is typical of Western Electric growth at Baltimore, Chicago and Kearny, N. J. It is growth made necessary to provide telephone apparatus whenever and wherever needed.

Western Electric

MAKERS OF YOUR TELEPHONE

$10,000,000 Phone Company Plan Revealed

An elaborate expansion program which calls for the expenditure of $10,000,000 within the next five years, was outlined by C. F. Mason, vice-president and general manager of the Associated Telephone Company, before the State Railroad Commission.

Two millions of this total will be expended within the next two years. Long Beach and the Santa Monica Bay district will derive the chief benefit as large sums already have been appropriated for new office buildings and exchanges in these centers.

As a witness for his company, Mason appeared before the commission in its investigation of the company's rates, asserted by the commission's engineers to be too high.

Following the testimony of three witnesses the case was ordered submitted by Commissioner Leon Whitsell. The investigation started on the commission's own motion. Engineers for the state filed reports claiming that the company earned 8.57 per cent profit on its operations at Long Beach, Santa Monica, San Bernardino, Westwood, West Los Angeles, Redondo, Covina, Huntington Beach, Laguna and other Southern California cities.

The commission was held in previous hearings that between 7 and 7½ per cent is a fair and equitable return.

Mason explained that the company's expansion program in the next five years would call for an outlay of $10,000,000 for new plants, buildings and real estate.

As to the activities of the company he volunteered to extend the present flat rate zones in the different cities in which his company operates, which he testified would save users many thousands of dollars annually.

By extending these so-called "flat rate zones," many patrons now paying mileage charges in addition to the regular monthly rental will have their service rate materially reduced.

Mason also offered to standardize the charges for moving telephones within a building at $1.50, the present charge being $5 in most of the exchanges; and to reduce the extra charges for hand telephones from 50 cents to 25 cents over the rate charged for desk telephones.

While on the stand Mason explained that steps had been taken to consolidate the many telephone companies in Southern California into one operating company known as the Associated Telephone Company, Limited.—Los Angeles Examiner, Wednesday, Dec. 4, 1929.

Book Review

Beginnings of Telephony, by Frederick Leland Rhodes. Harper & Brothers, New York. $4.00.

This book has for its purpose the presentation of material from original sources to familiarize students and workers in the telephone field with pioneer work in the telephone art. It is designed to bring the information down to the "middle period" of the art. In the foreword, General John J. Carty says: "The volume should be of especial interest to inventors, lawyers and students of our patent system, for in no other publication is to be found the history of the great legal controversies which raged about the invention of the telephone. . . . The author has given in this volume the essentials of the court decisions in that remarkable group of telephone cases which were characterized by Mr. Justice Brewer as the most important and the most protracted litigation which had arisen under the patent system in this country."

Not only does the author give the history of Bell's early work in the invention of the telephone but he reviews the claims of others to the invention. Along with the better known claims of Gray, Edison and Dolbear, he discusses the claims of Meucci, Drawbaugh, Cushman and others. Following the chapters on the fundamental invention are chapters on the beginnings of the microphone transmitter, the overhead wire plant, telephone cable, underground construction, loaded lines, the telephone switchboard, station apparatus, the phantom circuit, loaded lines and the long distance plant.

One of the features of the book that will be of increasing importance is the record of the work of a host of less well known workers who made important contributions to the art. For instance, a few people know of Watson's work in the production of the polarized ringer, but how many know the name of Hilborne L. Roosevelt, the inventor and patentee of the automatic switch hook device in universal use. Other cases might be cited.

The book is an invaluable record of early development in the telephone art and no library of telephone works can have any pretentions to completeness without a copy.

Northern White Cedar Association to Hold Annual Meeting January 14-15

The thirty-fourth annual meeting of the Northern White Cedar Association will be held at the Hotel Radisson, Minneapolis, Minn., January 14 and 15.

Mrs. Ray Blain in Hospital

Ray Blain, who has written several articles for TELEPHONE ENGINEER in the past, writes us that he is spending a month with Mrs. Blain, who is in a hospital in Denver, Colorado. Their friends will regret that it is necessary for this couple to spend the holidays in this manner.

W. S. VIVIAN NAMED VICE-PRESIDENT MIDDLE WEST UTILITIES CO.

At a meeting of directors of the Middle West Utilities Company December 10th, W. S. Vivian was elected vice-president in charge of public relations. Vivian has thousands of friends in the telephone industry who offer congratulations.

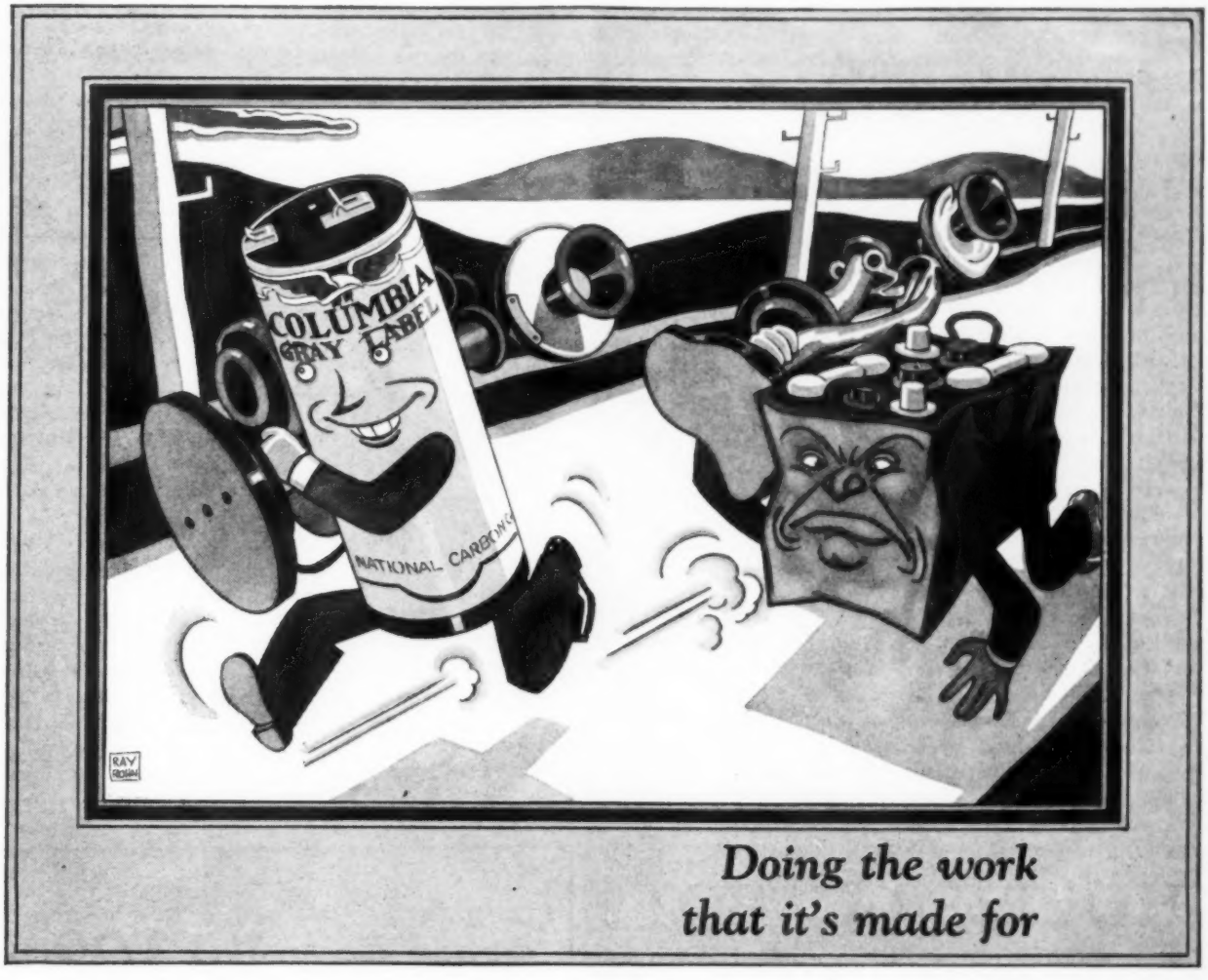
New Telephone Building

Sweetwater, Texas, Nov. 9.—At a cost of $400,000, a new central office building and new dial telephone equipment are to be built in this city by the Southwestern Bell Telephone Co. in the near future, according to reports reaching city officials. It is believed that work will start early in 1930. It is also reported that extension of the Dallas-Fort Worth-Cisco underground cable to Sweetwater will be undertaken early next year.

Telephones Increase 913,000

During the year ended June 30, 1929, the number of telephones in use in the United States increased 913,000. Much of this has occurred during the first six months of this year. The total increase in the Bell system alone in this period was 471,000, which is practically 27 per cent over the similar period in 1928. It is estimated that about 65 per cent of the new telephones were placed in homes and 35 per cent in business offices.

Bethany, Mo., will have a telephone system of a common battery type. The Middle States Utilities Company have already began work in that city on the installation of a new switchboard. The "cut-over" will be around December 15, if all outside work is completed by that time.



Doing the work that it's made for

YOU could run a telephone on a flashlight battery or an automobile battery . . . but that would be wasteful and inefficient. In this modern age there are more different ways of making batteries than there are of frying eggs.

Columbia Gray Label Telephone Cells are made for one purpose—and to do that as well and as long as possible. They are made to run telephones . . . efficiently and economically. That's their mission in life.

And these batteries will lower power costs. They last longer. Recuperate when not in use. If you want a battery that will run your telephones at the lowest possible cost, stock Columbia Gray Label Telephone Cells.

NATIONAL CARBON COMPANY, INC.
General Offices: New York, N. Y.
Branches: Chicago Kansas City New York, N. Y. San Francisco
Unit of Union Carbide and Carbon Corporation

Columbia
Telephone Batteries
Best by test–they last longer

Many Qualities Needed to Make Ideal Operator

Courtesy, Loyalty to Public Service and Self-Control Among Requirements

The Bell System telephone operator has to be a well-rounded person and many qualities have to be taken into consideration in selecting candidates for positions and during the early stages of employment. Many desirable traits are developed only as a result of training. Perhaps the most important is courtesy.

Next to courtesy comes loyalty. If an operator is not forgetful of self, sympathetic and loyal, she is not the type that will make a successful operator. Telephone history is replete with stories of girls who have sacrificed their time and their pleasure to answer the call of duty when emergencies arose. A short time ago a serious fire broke out in a midwestern city at around 2 or 3 o'clock in the morning, an hour when telephone calls are few and the office operating force is reduced to a minimum. Within 15 minutes, some twenty-seven girls appeared at the exchange of their own free will to help the night operators answer the mass of calls that were flooding the exchange, as a result of the conflagration. These were girls whose tour of duty was in the daytime, but they realized what the extra traffic meant to the girls then on duty, and they came gladly to offer their aid.

This quality of loyalty is not merely loyalty to the telephone company, it is loyalty to the public, for the telephone operator, by the nature of her services, is, in reality, a public servant.

Self-control is a quality which every telephone operator acquires to more or less of an extent, but it is desirable that she should possesses as much of this power over herself as possible, so that, in spite of the attitude of the public with which she deals, she will handle the calls that come to her switchboard patiently, tactfully and without irritation. She must also be mentally and physically alert, neat in her appearance, and she must have a pleasing voice, a voice that is clear and easily understandable. The candidates for positions for telephone operators do not always possess all these qualities, and it is the task of the telephone company to select girls who will develop these traits.

Don't Deposit Money and Checks in Your Telephone Directory

According to an A. P. dispatch from St. Louis to the San Francisco Chronicle, a citizen of that city was tackling the job of searching through 14,000 discarded telephone directories to see if he could find checks and currency totaling $1,355, which he had tucked away in his directory for safe keeping. A new directory had been delivered at his home and his old book with 13,999 others had been dumped into a freight car for shipment to a Chicago paper house.

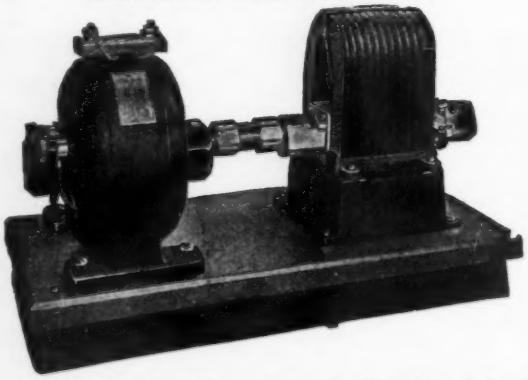
An Old Timer

Mrs. Charles H. Pickens of Omaha, Nebraska, is one of the few persons now living, who was present at the Philadelphia Centennial Exposition in 1876, and witnessed the memorable incident when Emperor Dom Pedro of Brazil picked up one of Alexander Graham Bells' telephones on exhibition there, and cried out, "My God, it talks." Mrs. Pickens, then a young miss, was visiting the exposition with friends, when she was attracted by the group of judges about Bell's exhibit; leaving her friends, she walked over to the exhibit and was just in time to hear the Emperor's now historic utterance. She also recalls seeing him pass the instrument to other members of the group and the expressions of wonder that appeared on their faces as they heard the voice of Bell transmitted over the wires from another part of the building. Thirty-nine years later, in 1915, Mrs. Pickens was present at a banquet in Washington, D. C., when the first transcontinental telephone line was opened and recalls vividly listening to the waves of the Pacific Ocean beat upon the shore.

HOLTZER-CABOT

Magneto - Ringing - Motor - Generators

ALWAYS DEPENDABLE



These units effectively replace all old-fashioned hand and battery ringing methods. Extreme simplicity of operation and low cost offer advantages over all other devices.

Cuts operating expenses by eliminating expensive and troublesome battery equipment.

Make possible a swift, sure, carefree service that pleases both subscriber and operating company as well.

Can be supplied for any voltage or special current. A thorough test will convince you.

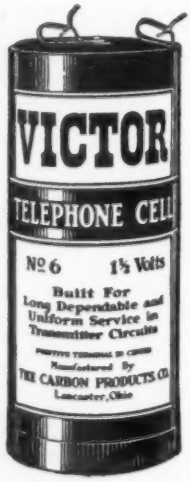
Complete data and specifications on request.

HOLTZER - CABOT ELECTRIC CO.

125 Amory Street, Boston, Mass.

6161 So. State Street, Chicago, Ill.

VICTOR TELEPHONE CELLS



The standard cell of the independent telephone industry. Uniform in quality. Dependable in service.

The Carbon Products Co.

LANCASTER, OHIO

11 South La Salle Street, Chicago

Identify your inquiry to advertisers by saying—"As shown in TELEPHONE ENGINEER"

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14 Mills — Main Office—Chicago, Ill. — 73 Warehouses
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CROSSARMS — FIR — Creosoted — Yellow Pine
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Super-Service on rush orders!

If you are in a hurry your order can be loaded and on the way the same day we receive it. Quality poles since 1882 assures you of guaranteed stock and satisfactory dealings. Let us quote you prices.

Northern and Western Cedar
With or without butt treatment

NAUGLE POLE & TIE COMPANY
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Branches: New York, Columbus, Kansas City, Spokane, Los Angeles, Boston, Madison.
Main Yards and Butt-treatment Plants: Minneapolis, Pinconning, Michigan, Spokane, Sand Point, Idaho, Seattle, Arrowhead, B. C.

Naugle Poles

Insure Your Overhead Lines

BY SPECIFYING

NORTHERN or WESTERN

CEDAR POLES

PLAIN or BUTT-TREATED

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Bell Cedar Poles
Piling & Ties
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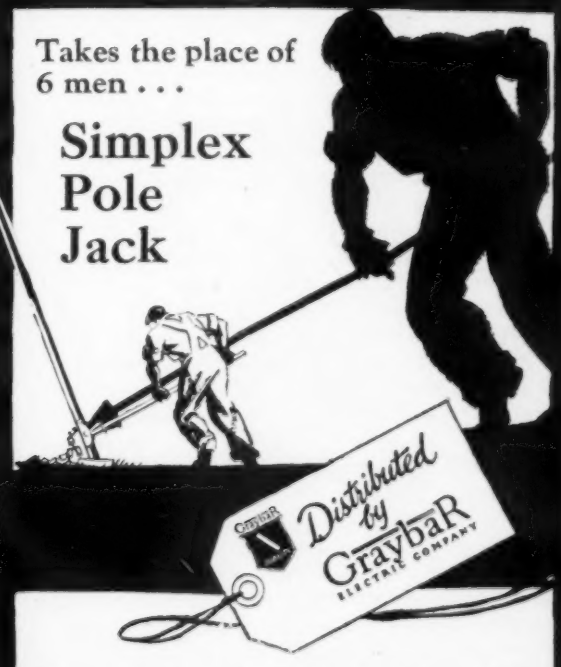
Guaranteed N. E. L. A., W. R. C. A., N. W. C. A. Grades
Treating Plants and Concentrating Yards
Minnesota Transfer, Minn., Newport, Wash.
Other Concentrating Yards at British Columbia Points
There Are No Better Poles Than Those Produced by
BELL LUMBER & POLE CO.
Security Building Minneapolis, Minn.
Long Distance Phone Atlantic 2304

Takes the place of 6 men . . .
Simplex Pole Jack



Templeton, Kenly & Co., Ltd.
Sole Manufacturers
Established 1899 Chicago, Ill., U. S. A.

Cedar Poles
Northern White Western Red
Plain or Treated Butts
Prompt Shipment from Minneapolis Yard.
T. M. Partridge Lumber Co.
Minneapolis, Minn.

With the Manufacturers

A Steel Frame Junior Multiple Switchboard by Stromberg-Carlson

More than sixty installations in this country and abroad of Stromberg-Carlson junior multiple switchboard equipment have convinced many owners and operators of small exchanges that it is possible to provide up-to-date service at a profit to the operating company.

The general acceptance of the Stromberg-Carlson junior multiple has exceeded the expectations of its most optimistic sponsors and the real reason behind this acceptance is that it has demonstrated its ability to provide the highest grade of service on a profitable basis.

The Stromberg-Carlson Telephone Mfg. Co. has always featured steel frame construction in its larger multiple equipments. In line with this policy of always keeping in the forefront of progress in the industry it is now applying the feature of steel frame construction to their junior multiple equipment.

This feature affords many improvements. The switchboard has a continuous black face, thus making the junior multiple the most attractive board of this type that has ever been produced.

The structural strength of the board also is greatly increased. Not only will the new junior multiple stand up under any strain after installation, but the possibility of glued cabinet joints opening during transportation is entirely eliminated.

Many magneto exchanges located in villages where no central power supply has been available until the last few years have been converted to central energy operation through the installation of the junior multiple.

It has always been the ambition of nearly every magneto telephone exchange manager to equip his exchange for central energy operation.

However, the usual central energy layout has been much too expensive for the small exchange to consider. The fact of the matter is that obtaining a profit from selling telephone service of any type, to small communities at present day operating costs, is an outstanding problem to the telephone operating man today.

The junior multiple switchboard has solved this problem with the better class of telephone service it affords. By installing a junior multiple and giving the public better service, a general increase in rates can be secured, resulting in greater profits to the operating company. Furthermore, subscriber lists are more apt to increase than to decrease under these conditions, because today the public demands up-to-date service, the cost being a secondary consideration.

Owners and managers of small exchanges have been eager to grasp the opportunity afforded by the junior multiple switchboard. The board is a standardized product and as such can be manufactured on a production basis. It has no frills and utilizes simple and reliable circuits. These features reduce costs so that both initial investment and operating costs are brought well within the means of any company operating more than fifty lines.

All cord circuits are universal, which means that both magneto and central energy telephones may be used, as conditions demand, without slowing up the service by forcing the operator to make special cord selection for the different types of service.

Following are several features offered by central energy service which make that type of exchange more profitable than the magneto exchange:

1. Uniformity of current supply.
2. Elimination of dry cells and cost of replacement.
3. A constant transmission level.
4. Positive supervision.
5. Uniformity in operating.
6. Reduced operating cost.
7. Simpler and, therefore, reduced cost of maintenance.
8. Lower investment in substation equipment.
9. Better rates.

Villages and small cities that have been equipped with out-of-date central energy systems have also welcomed the opportunity to get up-to-date equipment at the low cost that is possible with the Stromberg-Carlson junior multiple.

If the exchange is of less than 800 lines and the expected growth will not exceed that number for some years, the junior multiple solves the problem. It is a comparatively inexpensive board which will furnish the best service that can be obtained with any switching equipment of the non-feature type. It can best be described in a few words as the ideal board for the small office.

Stromberg-Carlson has taken a big step in adding the steel frame feature to its already outstanding junior multiple switchboard, which has put many small exchanges on a really profitable operating basis.

Improvements costing about $700,000 will be made at Fort Worth, Texas, by the Southwestern Bell Telephone Company.

Stromberg-Carlson Official Predicts Biggest Radio Year in 1930

Prediction that 1930 will be the biggest year in the history of the radio industry from the standpoint of sales was made by Ray H. Manson, chief engineer of the Stromberg-Carlson Telephone Mfg. Co., in a recent speech before the Rochester Engineering Society.

Mr. Manson explained that more and more radio owners will exchange their old battery sets for the modern all-electric receivers, as the public now realizes that the seemingly large original cost of the modern receivers in comparison with battery sets is more than equalized by the difference in cost of operation of both sets. He pointed out that the operation costs for electric current alone for the battery sets amounts to about $50.00 each year, while that of the modern "All-Electric" sets is only $10.00 for the same hours of operation. This is an annual saving of $40.00.

Another reason he gave for predicted increase in radio business for 1930 was that radio is no longer a luxury but a necessity everywhere—in the home, in the business house, in trains, in aviation, and in the schools—and he estimated the demand for the better makes of sets would greatly surpass the supply.

In speaking of the radio industry in 1929, Mr. Manson said, "This year has been the greatest radio year in the history of the business." The greatest factor in making this banner year was the improvement in radio apparatus. Notable among these advances was the A. C. screen grid tubes. These tubes have proven their worth and their performance has assured radio engineers that no changes are needed in them for 1930 sets.

The use of these screen grid tubes meant an improvement over 1928 sets in sensitivity, selectivity, audio amplification and better reproduction.

By the use of these tubes the 1929 sets also were made quieter and the A. C. hum has been practically eliminated.

Another big improvement incorporated in the 1929 sets, according to Mr. Manson, was the use of a UY-245 power tube which has provided greater volume without distortion in the receiver output circuit.

He told the engineers that the design of loud speakers centered around the built-in electro-dynamic type, which have afforded a very natural reproduction with big volume.

"Present indications are that the most noticeable changes in the 1930 radio receiving sets will be in the cabinets," Mr. Manson said. "Efforts will be directed by set designers to make cabinets more distinctive and to give them a note of individuality."

New Kellogg Switchboard at Boyertown, Pa., Exchange

It was a dramatic moment and certainly a proud one for the Conestoga Telephone Company, when on October 2nd the new Kellogg Switchboard at Boyertown, Pa., was formally cut over in the recently completed telephone exchange.

Just as the town clock struck ten, C. M. Thompson of the Kellogg Switchboard & Supply Company telephones from the new exchange to the old building the word "cut" and immediately the old board was put out of commission. At this signal Miss Alice March placed a fuse at the new exchange, putting the new Kellogg Universal Switchboard into service. Three operators were ready to initiate the Boyertown subscribers into Kellogg service, so there was no interference with calls. G. Frank Handwork, president of the Conestoga Company, put through the first call to Burgess H. Leon Breidenback. They exchanged greetings and congratulations on the wonderful new civic improvement.

This cutover marks another milestone in the history of the Conestoga Telephone Company, the growth and development of which makes an interesting story of success. The company was organized some twenty-eight years ago by thirty-six citizens of Caenarvon township, Berks county, when they installed a small board at Morganstown, Pa. Three years later a telephone system was put in at Birdsboro, Pa. In 1923 they purchased the Manatawney Telephone Company, serving 350 subscribers and operating a board at Yellow House. For the general betterment of service in that territory, negotiations were started with the Bell Telephone Company on June 1, 1928, to purchase from them the exchange at Boyertown, Pa. The deal was finally completed on November 1, 1928. The Conestoga Telephone Company is now giving 2100 subscribers, at Morgantown, Yellow House and Boyertown the best service available today.

The first move was to select a property for the new home of the company at Boyertown. A two-story brick building was purchased and altered to include the most modern improvements. In four months the new building was complete from the store room to an attractive rest room for operators.

Having already proved the worth of the Kellogg board at their other exchanges, Mr. Stoltzfus and the other directors contracted with the Kellogg Switchboard & Supply Company for a Universal Swithboard. This board accommodates either common battery or magneto telephones and adapts itself automatically to either class of service. The board has an ultimate capacity of 1,200 lines with a present equipment of 400 lines. The board now has three operators' positions, but is made so that it may be increased, if necessary, to twelve operators' positions. The complete battery plant, automatic ringing machines, charging machines and the main frame of 1,300 lines capacity, complete with arresters and heat coil protection has been installed.

FOR SALE

Telephone exchange, W. Va. In town of 3,500. Extensions into two states. Complete facilities. Price, $16,000. National Brokerage Company, Omaha, Nebr.

FOR SALE—W. E. Desk Bells, 2 and 3 box, 1,000 and 2,500 ohm, straight and biased ringers. Taken out account change to common battery. Box A, % Telephone Engineer, Chicago.

RECONSTRUCTED EQUIPMENT

Kellogg No. 6B Cordless P. B. X. board with 7 local lamp lines and 2 trunk Ckts. @ $50.00—10-local and 3 trunk type @	$65.00
Kellogg No. 97 or No. 118 Common battery desk set complete with No. 404 or No. 259 Steel signal sets, straight line or 16-33-50 and 66 cycle ringer	7.00
Keellogg or Dean drop coils, 100 ohm 35c ea. 500 ohm @	.50
Western Elec. No. 329 Transmitters with back & mouthpiece @	1.25
Western Elec. No. 250 or 229 Transmitters with back and mouthpieces @	1.15
Western Elec. No. 143 Receivers with cords @	1.25
Gray 3-slot wall or desk type paystations @	5.75
Gray 5c single slot desk or wall type paystations @	1.25
Kellogg No. 30A combine line drops and jacks, per strip of 10 @	12.50
Kellogg No. 28 3-bar 1000 or 1600 ohm Bdg. desk sets @ $10.00—4-bar $10.75—5-bar (all with New Cabinet inside connection signal sets) @	11 10
Kellogg No. 22 L. C. Transmitters with back and mouthpieces @	1.10

Write for Our Bulletin
REBUILT ELECTRIC EQUIPMENT CO. Not Inc.
1940 W. 21st St., Chicago

AMERICAN ELECTRIC AND MONARCH C. B. TELEPHONES

Latest type common battery desk set with enclosed gong steel bell box, straight line	**$7.75**
Harmonic	**8.00**
Latest type common battery steel wall set with enclosed gongs, straight line	**6.50**
Harmonic	**7.00**

BUCKEYE TELEPHONE and SUPPLY CO.
COLUMBUS, OHIO

FOR SALE

4-Position Western Electric Co.—1248 Common Battery Lamp Switchboards, equipped for 740 lines. One of these positions equipped with 15 pr. Universal Toll and Local Cord Circuits.

1—Mercury Arc Rectifier—10 Amp. Capacity.

1—Gasoline - Generator Set—24-36 Volt—20 Amp.

75—No. 294 Western Electric Co. Sub-s Sets, Less Receivers.

To move quickly this equipment can be bought cheap.

Petersburg Telephone Co.,
Petersburg, Va.

PEARL LIFE-TIME DROP WIRE BRACKETS
Save time, labor and waste. Hot-galvanized screw-hooks and malleable castings are separable and indestructible. Standard 2 groove porcelain. Stocked by telephone manufacturers.
WM. H. PEARL CO., Indianapolis

Send for free sample and prices on
UNIVERSAL DROP WIRE INSULATORS
Universal Specialty Company
711 Poplar St., Terre Haute, Ind.

UNIQUE FURNACE
GASOLINE—KEROSENE

PATENTED ARRANGEMENT FOR DISLODGING COIL WITHOUT TEARING DOWN FURNACE
PATENTED SEAMLESS TUBING COIL GENERATOR
IMPROVED ONE PIECE BURNER
HAND HOLD FOR CLEANER ONE TURN CLEANS ORIFICE
AUTOMATIC ORIFICE CLEANER
AUTOMATIC PUMP INSIDE TANK
18 GUAGE STEEL TANK WELDED BOTTOM

10 MINUTES TO MELT 50 lbs. OF SOLDER

But—more important—

The experienced cable splicer will be surprised at the length of time it will remain in the field without attention!

Literature?

UNIQUE MANUFACTURING CO., Inc
221 Whiting St. Chicago, Ill.

Enjoy Successful Season

The Home Telephone and Telegraph Company baseball team of Fort Wayne, Indiana, has enjoyed a most successful season on the diamond.

Winning twelve out of thirteen games played in the L. M. C. A. Commercial League of that city, the team won the championship in easy fashion. Victory in that league gave the players an opportunity to play and defeat the champions of the Y. M. C. A. Sunday School League in a playoff to decide who would be a finalist in the city championship game.

Coffing Hoist

The Universal Tool

Made by Coffing Hoist Co., Danville, Ill.

Three Sizes

Model	Rated	Weight
A	¾ ton	13 lbs.
F	1¼ tons	25 lbs.
F with super-attachment	3 tons	30 lbs.
Z	6 tons	60 lbs.

All models have standard lift of five feet. Additional lift procured by additional chain.

Model A and F particularly adapted to public utilities, telephone and telegraph construction and maintenance work.

A truly one-man tool; light, fast, powerful, simple, durable.

One man with Model F equipped with super-attachment can lift or pull 3 tons, These hoists used either end up, or in any position.

Useful and used for pulling guys, underground cable, messenger wires, pulling poles, lifting transformers, loading and unloading heavy supplies.

Even known to pull a truck out of the mud.

Telephone Ahead of Times

No industry is called upon to respond more quickly to the progress and changes made in the world than the telephone. It not only gives the service required today; it must be years ahead of the time in preparing for the future.

The great telephone achievements of recent years, such as international long distance and the general improvement in facilities throughout the world, have played an inestimably important part in the development of modern civilization.

Heard on the Bus

"I'm sorry, lady, but you'll have to put that cigarette out. There's a gentleman in the car."

Phone Rates to Be Lower

The American Telephone and Telegraph company will reduce toll rates January 1, effecting an annual saving to users of more than $5,000,000.

FOR SALE

2 conductor black silk desk stand and receiver cords, per set, 40c. W. E. No. 47 fuses, $6.00 per 100. W. E. No. 14 terminals, 16 pair less stubs @ $4.00. W. E. NEW 3 conductor swbd. cords with No. 109 plugs attached, 50c. Heminway No. 42 glass insulators @ $5.00 per 100.

The Telephone Repair Shop
6966 Ravenswood Avenue
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We will sell your
Telephone Directory ADVERTISING
or will publish your directory complete
L. M. BERRY & CO. DAYTON, OHIO

Make Your Directory a Source of Income
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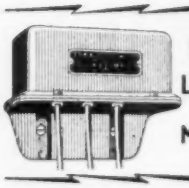

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LIGHTNING ARRESTERS
MADE BY
MINNESOTA ELECTRIC CO
MINNEAPOLIS, MINN.

EARL L. CARTER
CONSULTING ENGINEER
814 Continental Bank Bldg. Indianapolis, Ind.
Special attention given to all matters pertaining to Valuations and Investigation of Public Utility Properties.
Formerly Chief Engineer, Public Service Commission of Indiana

ACCOUNTING
Specialization on Public Utility Accounting Records and Audits enables us to best serve Telephone Companies.
HERDRICH AND BOGGS
Certified Public Accountants
901-7 Continental Bank Bldg., Indianapolis, Ind.

The Comfortable
Great Northern Hotel
CHICAGO

TRAVELERS select the Great Northern for its wonderful location in Chicago's "loop". They return because the large comfortable rooms, homelike environment, attentive service, excellent food and moderate charges make it an ideal hotel.

400 Newly Furnished Rooms
$2.50 a day and up

Sample Rooms
$4.00, $5.00, $6.00
$7.00 and $8.00

Dearborn St. from Jackson to Quincy
New Garage One-Half Block

Telephone Engineer

HOLDING POWER!!

The essential factor when anchors are being specified.

KEARNEY HI-TENSION
4-in-1 EXTENSION ANCHORS

Have the greatest holding power on equal inches of surface. Made of certified malleable iron.

OTHER TELEPHONE SPECIALTIES

Guy Wire Clips, Screw Anchors, Solderless Service Connectors, Cable Ring Saddles

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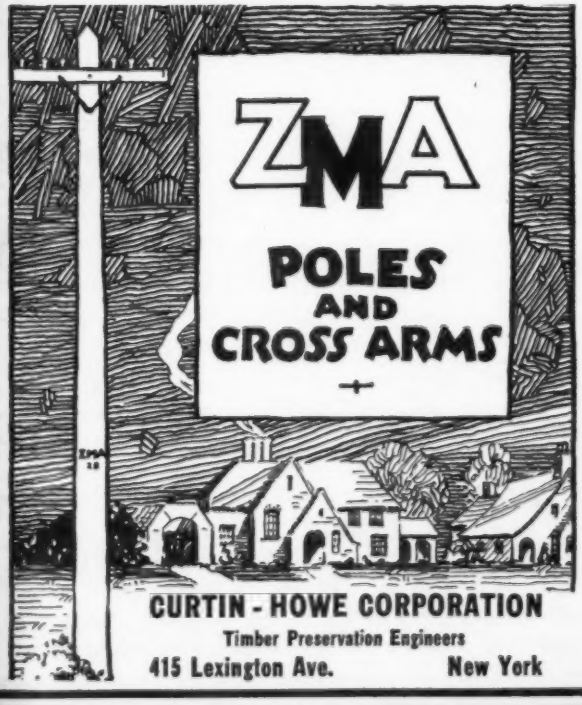


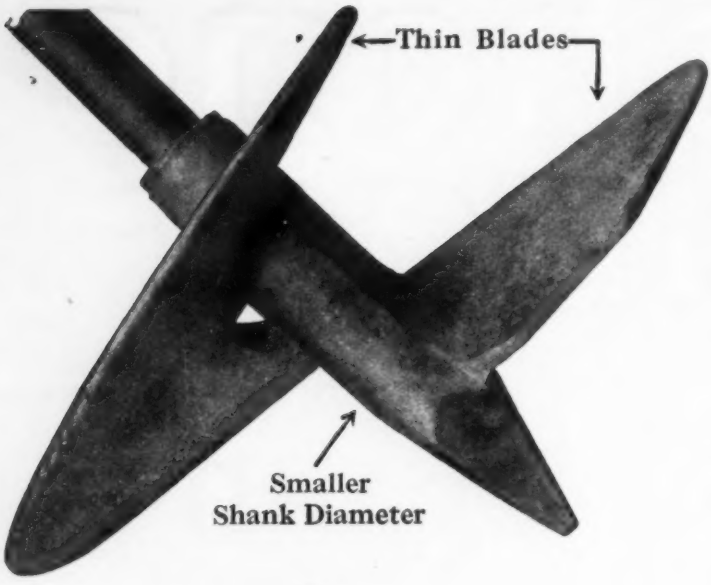
CURTIN - HOWE CORPORATION
Timber Preservation Engineers
415 Lexington Ave. New York

SANDS ELECTRIC CO.

Merry Christmas

We appreciate the part you have had in our success during the past year and hope that 1930 will bring happiness and prosperity to you.

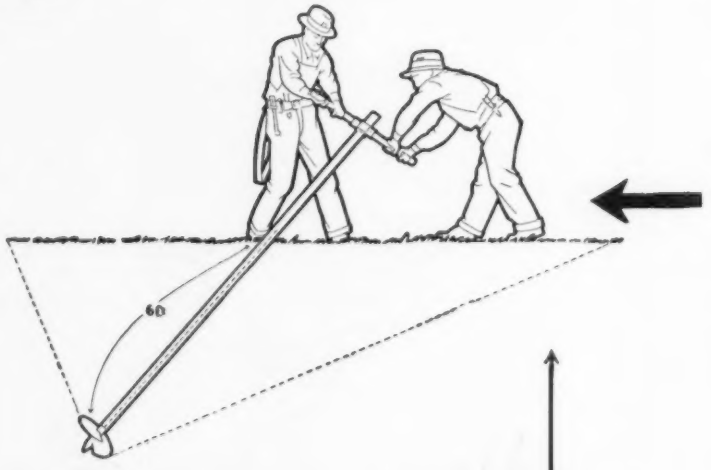
Sands Electric Co.
North Chicago, Illinois



SEE HOW

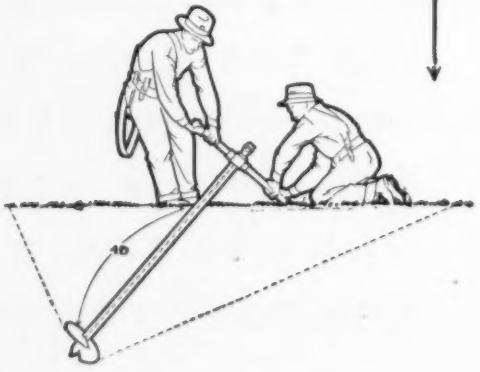
the new Matthews Scrulix Anchors get their tremendous holding power

50% greater holding power guaranteed!



Note difference in size of cones of earth

Any Other Screw Anchor



Size for size the new Matthews Scrulix Anchors can be put down two feet deeper than any other screw anchor in the same length of time. The new Matthews Wrench permits the men to stand in upright comfortable positions during entire installation—even when end of rod is down to ground level—as the handle can be moved up and down the extra long wrench.

With any other screw anchor the wrench handle catches on the ground while the anchor rod is still two feet out of the ground—yet the anchor is down as far as the wrench can put it unless the men dig the ground away or use a ratchet handle; it has always been difficult, if not impossible, to get them to do this. Compare the size of the cones of earth on the two illustrations at the left. The extra depth of the new Scrulix is what gives it the tremendous holding power. Tests show 100% greater—we guarantee 50%.

In extra hard clay or disintegrated rock drill a pilot hole with the 381 Matthews Auger. This will make installation easy and enable you to get anchorages up to strength of the rod at less cost than with any other anchor. Ask for circular that tells all. W. N. Matthews Corporation, Engineers and Manufacturers 3714 Forest Park Blvd., St. Louis, Mo.

THE NEW PREHEATED CERTIFIED MALLEABLE

MATTHEWS SCRULIX ANCHORS

Patents Applied for

TELEPHONE ENGINEER, December, 1929. Volume 33, No. 12. Published monthly by TELEPHONE ENGINEER. Publication Office 192 N. Clark St., Chicago, Ill. Subscription price $2 a year in the U. S. Entered as second-class matter June 6, 1922, at the Post Office at Chicago, Ill., under act of March 3, 1879.

Reliable

Terminals

A27
Protected Terminal

P495

The sawtooth metal airgap discharge blocks used in all cable terminals, central office equipment and many individual station arresters.

Reliable **PRODUCTS** consist of many types of cable protection, various types of individual station arresters listed as standard by the Underwriters' Laboratories. Catalogues or samples sent upon request.

"the choice of the majority"

Reliable Electric Company

3145 Carroll Avenue Chicago, Illinois

The lighthouse is the mariner's friend, pointing the way to harbor through channels that are safe for navigation. In the same way the Stromberg-Carlson Super-Service Switchboard is the operating company's friend, pointing the way to better profits through a moderate first cost, simplified operation and low up-keep.

Because of the moderate cost of Stromberg-Carlson Super-Service Switchboard equipment a low deduction is required for fixed charges. This leaves a larger surplus for profits than any other type of equipment.

Every Stromberg-Carlson Super-Service Feature simplifies the work of the operator which enables her to take care of more calls than is possible with any other switchboard. Furthermore, operation is so simple that little time is consumed in training operators.

The absence of all ringing keys except one set per position is a reason for the low upkeep of the Stromberg-Carlson Super-Service Switchboard. Another reason is the ruggedly built No. 190 Type Line and Cut-off Relays with which it is regularly equipped.

Stromberg-Carlson engineers are prepared to point out the way to better profits for operating companies by demonstrating to you that the Super-Service Switchboard is the most efficient and economical telephone switching equipment available.

Write for Bulletin 117

Features of the Stromberg-Carlson Super-Service Switchboard:

Operator's Ringing Control	Audible Busy Test
Calling Subscriber's Ringing Control	Positive Supervision
Reverting Busy Test with Tone	Non-ring Signalling
Operator's Listening Indication	Emergency Ringing
Instantaneous Ringing Cut-Off	Operator's Cut-In
Instantaneous Ringing Start	Machine Ringing
Operator's Secret Service	Flash Recall
Visual Ringing Indication	Dark Keyboard
Advance Plugging-In	Operator's Bar
Reverting Call Ringing	Ringing Tone
	Call Registration

Pacific Coast Representative
Garnett, Young & Co.
San Francisco, Cal.
Los Angeles, Cal.
Portland, Ore.
Seattle, Wash.

Stromberg-Carlson Telephone Mfg. Co.
Factory and General Offices:
ROCHESTER, N. Y., U. S. A.
Branch Offices:
KANSAS CITY, MISSOURI CHICAGO, ILLINOIS TORONTO, CANADA

Southern Representative
Scoville Mercantile Company,
Atlanta, Ga.

Stromberg-Carlson

Identify your inquiry to advertisers by saying—"As shown in TELEPHONE ENGINEER"

MISUNDERSTANDINGS

She types instead of telephoning...

are impossible when messages are transmitted by this device that sends typewriting by wire!

Have you subscribers who experience difficulty in understanding telephone conversations because their instruments are located in noisy offices or factories?

Or subscribers who hesitate to transmit peculiar names and addresses, unusual words, figures and other intricate data over the telephone because of the possibility of a misunderstanding?

Such subscribers will pay liberally for the service that Teletype . . . the Telephone Typewriter . . . provides. By means of this service it is possible to transmit and record figures, names, addresses, orders, formulas and specifications with absolute accuracy, even though the receiving machine is located in the noisiest office or factory.

How Teletype . . . the Telephone Typewriter . . . puts an end to errors

Teletype, as its name implies, sends typewritten messages over telephone wires. Depressing a key on the sending machine causes both the sending and receiving machines to print that letter . . . instantly! As the operator can see what is being sent, errors in transmission are virtually impossible.

Machines can be used in either direction, making it possible to send a message and receive a reply immediately. No special operator is required, as any typist can use Teletype.

An outstanding advantage of Teletype is that it provides a typewritten record for filing at both ends. Thus it does away with the annoying necessity of having to confirm telephone conversations by letter.

Many telephone companies in the United States and Canada are now providing their subscribers with Teletype service at good profit to themselves. Its dependability has been proved by years of use on the part of telephone and telegraph companies, railroads, press associations and industrial organizations. Mail the coupon at once for further details of this profit-making service.

. . . and miles away her message is recorded INSTANTLY!

TELETYPE

THE TELEPHONE TYPEWRITER

MAIL FOR FURTHER FACTS

For full information concerning the Telephone Typewriter and its cost, sign this coupon, pin it to your letterhead and mail to the TELETYPE CORPORATION, 1400 Wrightwood Ave., Chicago.

*Name*_____

*Position*_____ T. E. 12-29

Here's A Practical Plan for Increasing Your Business

The many attractive features of the Monophone have made it one of the finest business stimulators for telephone service. Those telephone companies which have used it in their advertising have reported unusual success. The results have been shown, not only in direct orders for Monophone installations, but also in a renewed interest in every phase of telephone service—a natural public response to the progressiveness of the company which makes this modern instrument available.

To assist the telephone company in employing the publicity features of the Monophone in its advertising, American Electric Company, Inc. has prepared six illustrations portraying the advantages of this distinctive telephone to the telephone user. By using cuts of these illustrations as a basis in its advertising, the telephone company can focus the attention thus gained to the particular end desired—whether it is more Monophone installations, new subscribers, increased usage of extension service, or any of the various revenue producing services.

Electrotypes of these illustrations suitable for newspaper reproduction are available to all telephone companies, without charge. Your request will receive immediate attention. Write for them.

American Electric Company, Inc.
State and 64th Streets CHICAGO, U. S. A.
Branch Office and Warehouse: 7th and Wyandotte Streets, Kansas City, Mo.

The Monophone shown on the left is the standard all-black style, which blends perfectly with any decorative treatment and has the same grace of line and convenience of operation inherent in all Monophone models. The selections available in colored models are orchid, Nile green, old ivory, Chinese red, royal blue, maroon, mahogany and walnut, with metal fittings in either gold or chromium plate.

Extension Service—An Excellent Source of Additional Income

THE new Monophones provide telephone companies with an effective sales argument for additional extension business. It is surprising how many women desire these attractive instruments for extension service in upstairs rooms, especially when they see the different colors in which they can be had. Available in delicate shades of orchid, pale green and ivory, as well as deep red, green and blue, the Monophone in color is a smart and artistic addition to any room.

Men are particularly pleased with the mahogany and walnut Monophones, with metal parts plated either in gold or chromium, which are ideal for extension use in the library or den at home, or for inner rooms in the office downtown. Up-to-date and aggressive telephone organizations everywhere are actively going after extension business, using a modern sales appeal based on the Monophone's attractiveness and convenience—and, what is more important, *are getting it.* Your request will bring you color circulars on the Monophone to help you get *your* share of this business.

Automatic Electric Inc.

Manufacturers of

STROWGER AUTOMATIC DIAL TELEPHONE AND SIGNALING SYSTEMS

Factory and General Offices: 1033 West Van Buren Street, Chicago, U. S. A.

Sales and Service Offices in All Principal Cities

GENERAL EXPORT DISTRIBUTORS

The Automatic Electric Company, Ltd., Chicago

In Canada . . . Independent Sales and Engineering Co., Ltd., Vancouver
In Australasia . . . Automatic Telephones, Ltd., Sydney
In Japan . . . Automatic Telephones Ltd. of Japan, Tokyo

ASSOCIATED COMPANIES

American Electric Company, Inc. . . . . Chicago
International Automatic Telephone Co., Ltd., London
Automatic Telephone Manufacturing Co., Ltd., Liverpool
The New Antwerp Telephone and Electrical Works . . . . . Antwerp

PUBLIC LIABILITY PROPERTY DAMAGE

Thrifty Bill Says

"Let us protect you against accidents."

INSURANCE AT A SAVING

—but above all—

DEPENDABLE

A Post Card will bring you the facts and figures

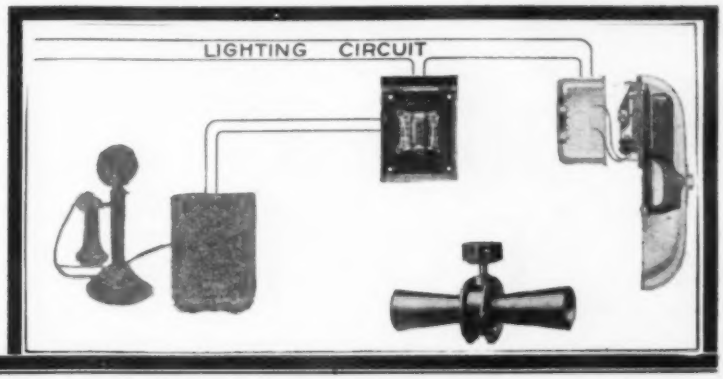
LYNTON T. BLOCK & CO.
ST. LOUIS, MO.
UNDERWRITERS OF SELECTED CLASS INSURANCE AT A SAVING

511 Locust St. St. Louis, Mo.

Specialized Insurance for Telephone Co.'s

WORKMEN'S COMPENSATION AUTOMOBILE

Extra Profits in Installing



Signal Engineering Telephone Extension Ringing Sets

Locking Relay Set

For use on such applications as police and taxicab visual and audible signalling. Also throughout industrial plants where loud signals are desired to be operated on lighting circuits.

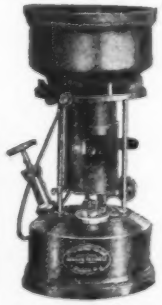
Approved by Underwriters' Laboratories, Inc.

Products: Fire Alarm Systems, Vibrating Bells, Horns, Single Stroke Bells, Whistles, Special Tone Signals, Code Calling Systems, Tank Alarm Systems, Relays.

SIGNAL
ENGINEERING & MFG. CO.
152 WEST 14TH STREET, NEW YORK

DESIGNED FOR THE JOB!

"ALWAYS RELIABLE"



No. 32 1 Gallon. Kerosene-Gasoline. Covered by Patents.

"ALWAYS RELIABLE" furnaces and torches can be relied upon for perfect performance during windy, cold and snowy weather in winter.

These furnaces and torches are ideally suited for telephone workers and linemen's jobs. That is why most telephone men use "ALWAYS RELIABLE" furnaces and torches.

Order through your jobber or mail your order to us with your jobber's name.

OTTO BERNZ CO., Inc.
NEWARK NEW JERSEY
Stocks in Newark, N. J., San Francisco, Calif., New York City

TELERING

For Central Office and PBX Ringing

ONE REED!

ONE CONTACT!

IDEAL WAVE FORM

ORDER ONE ON TRIAL.

NO OBLIGATION TO KEEP.

Fully Guaranteed

Converts 60 Cycle Lighting Current to 20 Cycle Ringing Current.

POSITIVELY NO RADIO INTERFERENCE

Very low current consumption.

Model EX-3 has been proven the ideal ringing machine by hundreds of satisfied users.

Price $44.00—F. O. B. Elyria

IT PAYS FOR ITSELF

Sold by Leading Telephone Distributors

Telkor, Inc., Elyria, Ohio

(Write for booklet)

PERFECT RHYTHM

The swiftest bird, the fastest animal, both travel in graceful, rhythmical movements. One marvels at their speed and endurance. The answer is exact timing, perfect rhythm, the kind of motion that most nearly eliminates fatigue.

In the operation of a Kellogg Service Switchboard, the principle of perfect rhythm has been developed to a marked degree, permitting a greater production of calls per operator without nervous strain on the personnel.

This is brought very forcibly to one's attention when watching the operation of a Kellogg Service Switchboard, especially during peak load periods. The operators answer and complete calls with sure, swift movements, yet they do not appear to be exerting themselves. The peg count, however, will show that each operator is handling from five hundred to six hundred calls an hour.

The underlying reason for such operating speed is the fact that the operator has only three operations to perform—insert answering plug—insert calling plug—depress ringing key. From that point the call is automatically completed.

Because each operator can easily speed up and handle a larger number of calls, adequate telephone service can be given in emergencies without increasing the switchboard investment.

Maintenance costs are reduced considerably because the Kellogg Service Switchboard requires so little attention. What few adjustments that are necessary can be taken care of by any good switchboard man.

Our engineers will gladly show you how to "prove in" a Kellogg Service Switchboard for your exchange.

Kellogg Switchboard and Supply Company

1020-1070 West Adams Street
Chicago, Illinois

Columbus Kansas City San Francisco Portland Shanghai

Communication *within* the Home . . . or to the Outside . . . over the same Telephones

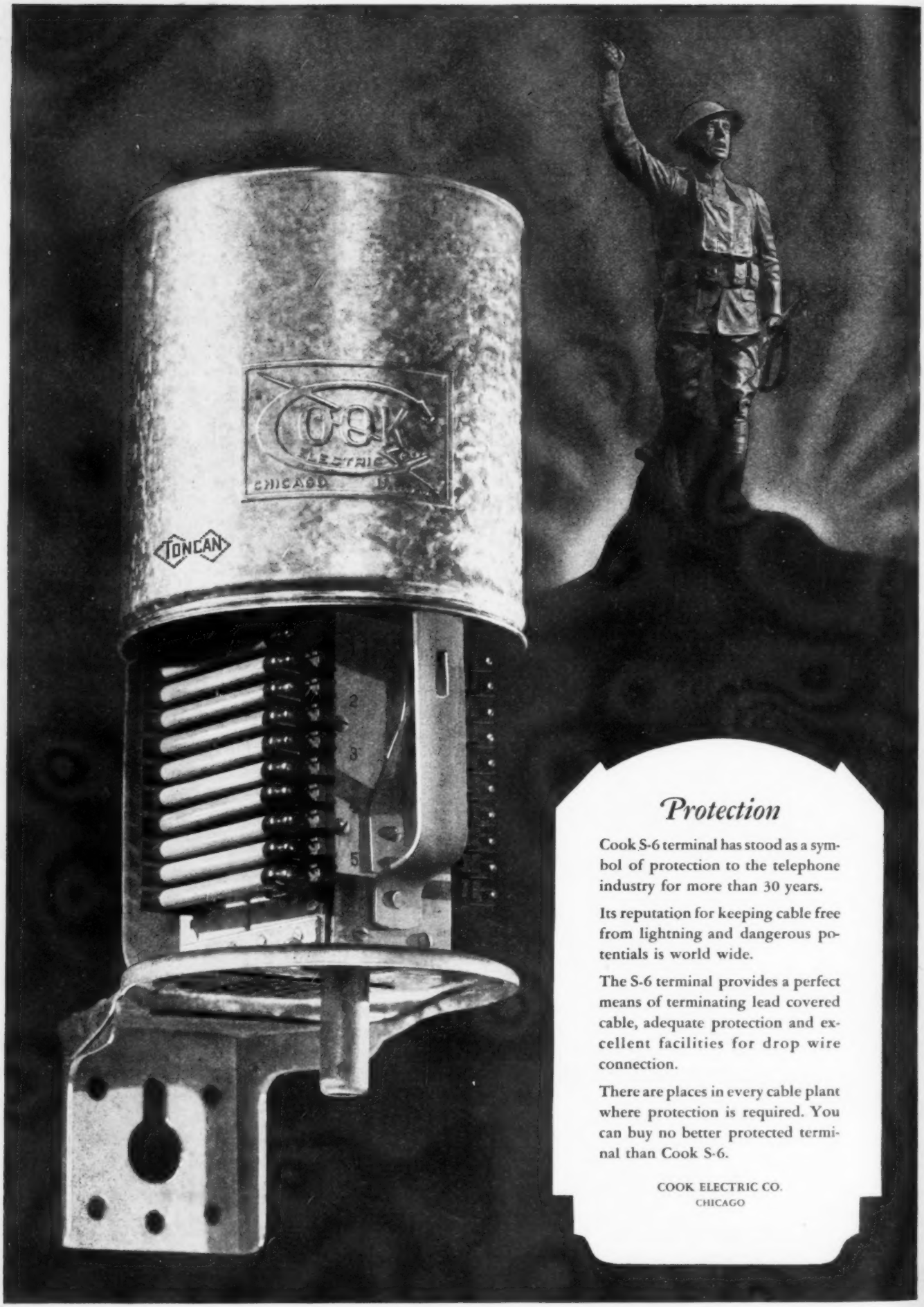
MANY HOME BUYERS these days want communication within the house, as well as to the outside . . . bedchamber to kitchen, for instance. Bell System equipment makes it possible to have this intercommunication over certain of their telephones without interfering with outside calls.

This is but one of the features of modern telephone convenience, which is becoming so popular throughout the country. The basic idea is to have *enough telephones*—conveniently placed to give complete ease and comfort in the use of telephone service.

Builders find it a strong selling aid to provide for this telephone convenience, by placing conduit within the walls of a house during construction. Telephone outlets are made available in nearly every room. The home buyer can then have telephone service right where he wants it—with the added appearance which comes from concealed wiring. He can use just those outlets which best meet his requirements.

Your local Bell Company will be glad to plan with you the telephone conduit arrangements for your new buildings. There is no charge for this service. Just telephone the Business Office.

In the above advertisement, appearing this month in magazines edited for builders, the Bell System discusses some of the advantages of providing conveniently located telephone outlets, and telephone conduit, throughout the house.



Protection

Cook S-6 terminal has stood as a symbol of protection to the telephone industry for more than 30 years.

Its reputation for keeping cable free from lightning and dangerous potentials is world wide.

The S-6 terminal provides a perfect means of terminating lead covered cable, adequate protection and excellent facilities for drop wire connection.

There are places in every cable plant where protection is required. You can buy no better protected terminal than Cook S-6.

COOK ELECTRIC CO.
CHICAGO

Now in Color

The Monophone

Jade Green

Conceived and perfected—

For telephone executives who believe that intelligent regard for the trend of public taste is essential to progress—

For business men who find pleasure and pride in combining utility and beauty in their places of business—

For the ever-growing group of telephone users who are constantly reaching for beauty as well as convenience.

The Mod

Mahogany

Chinese Red

Orchid

Nile Green

In perfect harmony with the finest Appointments of Home or Office

Black

...phone *in Color*

Today's vogue is for color. Appreciation of its charm is constantly widening. Its influence is seen in homes and in places of business more and more each day.

The adaptation of color to the Monophone, itself the most phenomenal success in the history of telephone instrument design, is a natural outcome of this growing public appreciation of good taste.

After careful studies of color harmony and investigation of popular preferences, the colors shown in this folder have been selected as best meeting the range of public favor and embracing the widest variety of conditions. They have been proved capable of pleasing the most fastidious of critics.

Colored Monophones are moulded from the popular colored synthetic resins (Bakelite or Durez). In ordinary use the parts are practically indestructible, while the color and the finish are both brilliant and perm... no lacquer or other surface finish being used.

The metal fittings—dial, cradle, and hand unit bands—are available in either heavy chromium plate, bea... polished, or in heavy pure gold plate with a satin ...ish. Any of the colors shown (including black) may be ha... with either chromium or gold plated fittings. Colore... silk cords are furnished to match.

Dial Monophones in color are available only in the style shown, but with any of the standard central battery Monophone circuits. They are priced at a moderate increase over the corresponding black instruments. Ringer boxes are furnished in black enamel only.

Automatic Electric Inc.

Factory and General Offices: 1033 W. Van Buren St., Chicago, U. S. A.

EXPORT DISTRIBUTORS

For Australasia . . . . . Automatic Telephones, Ltd., Sydne...
For Canada . . . . Independent Sales & Engineering Co., Ltd., Vancouv...
Elsewhere . . . . . The Automatic Electric Company, Ltd., Chica...

Royal Blue

Maroon

Old Ivory

FOR MANUAL SERVICE

The Monophone WITH DI… BLANK

in Color

The manual Monophone (with center stem) is supplied to telephone subscribers by scores of the leading telephone companies the world over. This style is available in black only.

Telephone companies operating manual equipment may extend the advantages of colored Monophones to their subscribers by the installation of the style shown above.

Moulded from the popular colored synthetic resins (Bakelite or Durez), this style is available in any of the colors indicated on this page, with silk cords to match and with either gold or chromium plated fittings, including a neat number card holder in the space ordinarily occupied by the dial. Permits easy adaptation to dial operation at any time.

American Electric Company, Inc.

State and 64th Streets - CHICAGO, U. S. A.

Branch Office and Warehouse: 7th and Wyandotte Streets

PROGRESS

A few years ago we started the manufacture of our *Sheet Steel Expanding Anchor*, in both Two and Four-Way Types - Yes - made of *Sheet Steel* - because *Facts* proved *Steel* would give the *Maximum Performance* when buried in the *Ground* and have the required *Resistance* to *Rust*. We did not blindly arrive at this *Decision*, but did so after an untiring search and collection of *Facts* backed by the best *Engineering Data* obtainable.

During this *Period* we have been presenting and competing with *Anchors* made of other *Metals*, and our seemingly *Radical Decision* has *Proven* every *Claim* advanced by *Science*. The ready *Acceptance* by the *Users* have made the *Chance All Steel Expanding Anchor* the most popular of its class.

Eight inch Four-Way Illustrated
List $1.95 each f.o.b. Centralia, Mo.
125 Square Inches of holding surface.

Made in Two & Four-Way Types
in Sizes of 6, 8 & 10 inches.

Chance Thimbleye Anchor Rod

Nut Retainer prevents Anchor sliding up on Rod when installing. An Exclusive Feature.

Chance Company

Centralia, Missouri.

Manufacturers Of

Never-Creep Anchors
Expanding Anchors
Cone Anchors
Screw Anchors

Thimbleye Anchor Rods
Thimbleye Anchor Bolts - Straight & Angled
Chance Capstan Pulley Blocks
& A Full Line Of Guying Specialties

Distributed By
LEADING WHOLESALERS OF ELECTRICAL MATERIALS.

The dating nail is our assurance that every *International* Pole contains sound timber . . . . seasoned under chemical control . . . . framed to meet any specifications . . . . and scientifically treated with high grade creosote oil. It is your protection against inferior timber and treatments.

International Poles in service 30 years and still strong prove International methods.

2IC9
The International Dating Nail

International Creosoting & Construction Co.
General Offices: Galveston, Texas

International
Creosoted Yellow Pine Poles